EXHIBIT 2

PUBLIC REDACTED VERSION

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

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Salt Lake City, UT 84114

STATE OF NEW YORK
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New York, NY 10005

STATE OF NORTH CAROLINA
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Raleigh, NC 27602

STATE OF TENNESSEE
P.O. Box 20207
Nashville, TN 37202

STATE OF ARIZONA
2005 North Central Avenue
Phoenix, AZ 85004

STATE OF COLORADO
1300 Broadway, 7th Floor
Denver, CO 80203

STATE OF IOWA
1305 E. Walnut St., 2nd Floor
Des Moines, IA 50319

STATE OF NEBRASKA
2115 Nebraska State Capitol

Case No. 3:21-cv-05227

Lincoln, NE 68509-8920

STATE OF ALASKA
1031 W. Fourth Avenue, Suite 200
Anchorage, AK 99501

STATE OF ARKANSAS
323 Center Street, Suite 200
Little Rock, AR 72201

STATE OF CALIFORNIA
455 Golden Gate Ave, Suite 11000
San Francisco, CA 94102

STATE OF CONNECTICUT
165 Capitol Avenue
Hartford, CT 06106

STATE OF DELAWARE
820 N. French St., 5th Floor
Wilmington, DE 19801

DISTRICT OF COLUMBIA
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Washington, D.C. 20001

STATE OF FLORIDA
PL-01, The Capitol
Tallahassee, FL 32399

STATE OF IDAHO
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Boise, ID 83720

STATE OF INDIANA
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Indianapolis, IN 46204

COMMONWEALTH OF KENTUCKY
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STATE OF LOUISIANA

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Baton Rouge, LA 70804-9005

STATE OF MARYLAND
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Baltimore, MD 21202

COMMONWEALTH OF MASSACHUSETTS
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Boston, MA 02108

STATE OF MINNESOTA
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St. Paul, MN 55101

STATE OF MISSISSIPPI
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STATE OF MISSOURI
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STATE OF MONTANA
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STATE OF OKLAHOMA
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STATE OF OREGON
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Providence, RI 02903

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Pierre, SD 57501

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Austin, Texas 78701

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Richmond, VA 23219

STATE OF WASHINGTON
800 Fifth Ave., Suite 2000
Seattle, WA 98104

STATE OF WEST VIRGINIA
812 Quarrier St., First Floor
P.O. Box 1789
Charleston, WV 25326

Plaintiffs,

v.

GOOGLE LLC, GOOGLE IRELAND LIMITED, GOOGLE COMMERCE LIMITED, GOOGLE ASIA PACIFIC PTE. LIMITED, GOOGLE PAYMENT CORP., and ALPHABET INC.,

Defendants.

Expert Report of Dr. Marc Rysman

October 3, 2022

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I. Introduction

A. Qualifications

1. My name is Marc Rysman. I am a Professor of Economics, and Chair of the Department of Economics, at Boston University, where I teach undergraduate and graduate courses in industrial organization, econometrics, antitrust, and regulation. I specialize in industrial organization and applied econometrics, and my research focuses on industrial organization and competition, and the related issues of antitrust and regulation. In particular, I focus on the issues of network effects, platform markets, two-sided markets, standardization, and compatibility. I have studied a variety of industries, such as financial markets, telecommunications, payment cards, consumer electronics, and Yellow Pages directories. My research is primarily empirical but includes theoretical work as well.

2. I have been a visiting scholar at the Federal Reserve Banks of Boston and of Minneapolis, as well as at Harvard University, the Massachusetts Institute of Technology, and the Center for Studies in Industrial Organization at Northwestern University. Since 2020, I have been on the Scientific Committee for an Online Seminar on the Economics of Platforms at Toulouse School of Economics in Toulouse, France. On invitation, I have taught several short courses in economics related to two-sided markets, network effects, demand estimation, and econometrics, including at Shanghai University of Finance and Economics, Fordham Competition Law Institute Training for Agency Economists, and Hitotsubashi University. I have been an invited lecturer on network effects, platforms, and digital industries at Toulouse School of Economics, the Federal Reserve Bank, and the European Association for Research in Industrial Economics among others, and at various conferences on platforms and payment networks.

3. I am the author or co-author of more than 35 published articles, many of which have been published in leading peer-reviewed journals, including the *American Economic Review, RAND Journal of Economics*, *Review of Network Economics*, the *Journal of Applied Econometrics*, and the *Journal of Political Economy*, among others. I have also held editorial positions at leading economic journals, including *RAND Journal of Economics*, *Journal of Industrial Economics*, *Review of Network Economics*, and *International Journal of Industrial Organization*, and I am a former President and current member of the Board of Directors of the Industrial Organization

Society. I have received several grants from the National Science Foundation, including grants to study network effects, and from the Networks, Electronic Commerce and Telecommunications (NET) Institute. I have received several awards, including the Christensen Award in Empirical Economics, the Neu Family Award for Teaching Excellence (2006 and 2012), the Gerald M. Gitner Award for Excellence in Undergraduate Teaching in Economics (2000), Graduate Advisor of the Year in Economics (2022), and Professor of the Year for Boston University in 2007 (as chosen by BU's Greek societies). I received my Ph.D. in Economics from the University of Wisconsin-Madison in 1999 and my B.A. in Economics from Columbia University in 1992.

4. I have served as an expert witness in various legal proceedings, including antitrust matters involving payment cards and the high-tech sector. I have also served as a consultant to businesses and regulatory agencies, including the Federal Communications Commission and the Federal Reserve Bank. In 2012, I was commissioned to write a paper on interchange fee policy and its effect on competition in the payments card market, entitled "Payment Networks," which I presented to then-Chairman Ben Bernanke, then-Vice Chairman Janet Yellen, and the other members of the Board of Governors of the Federal Reserve Bank at an "Academic Consultant's Conference for the members of the Board of Governors."

5. A copy of my curriculum vitae, which describes my education, teaching experience, publications, and testifying experience, is attached as Appendix A.

B. Assignment

6. I have been retained as an independent expert in antitrust economics by the Attorneys General for 39 states, commonwealths, and districts of the United States (hereafter referred to simply as the "States")[1] (a) to evaluate the competitive effects of certain alleged conduct

[1] The states, commonwealths, and districts include Utah, New York, North Carolina, Tennessee, Arizona, Colorado, Iowa, Nebraska, Alaska, Arkansas, California, Connecticut, Delaware, District of Columbia, Florida, Idaho, Indiana, Kentucky, Louisiana, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Montana, Nevada, New Hampshire, New Jersey, New Mexico, North Dakota, Oklahoma, Oregon, Rhode Island, South Dakota, Texas, Vermont, Virginia, Washington, and West Virginia.

by Google in relation to the Google Play Store and Google Play Billing and (b) to quantify damages, if any, to consumers in the States and nationwide resulting from this challenged conduct.

C. Materials Considered

7. To evaluate the competitive effects of Google's challenged conduct and form my opinions, I have reviewed a series of materials, both publicly available and those produced in this litigation. These include Google documents, deposition testimony and associated exhibits collected in this matter[2], academic literature, regulatory reports and decisions in the U.S. and other

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[2] Deposition of Christian Cramer, Finance Director for Play at Google, January 13-14, 2022 (hereafter "Cramer (Google) Deposition"); Deposition of David Kleidermacher, Vice President, Engineering, at Google, February 3-4, 2022 (hereafter "Kleidermacher (Google) Deposition"); Deposition of James Kolotouros, Vice President, Android Platform Partnerships at Google, February 2-3, 2022 (hereafter "Kolotouros (Google) Deposition"); Deposition of Jamie Rosenberg, Vice President of Strategy and Operations, Platforms and Ecosystems Division, at Google, February 10, 2022 (hereafter "Rosenberg (Google) Deposition"); Deposition of Michael Marchak, Director of Play Partnerships, Strategy and Operations, at Google, January 12-13, 2022 (hereafter "Marchak (Google) Deposition"); Deposition of Paul Feng, Product Management Director at Google, January 14 and 18, 2022 (hereafter "Feng (Google) Deposition"); Deposition of Sameer Samat, Vice President of Product Management at Google, February 2-3, 2022 (hereafter "Samat (Google) Deposition"); Deposition of Tian Lim, Vice President, Engineering, Product and UX, at Google, December 2, 2021 (hereafter "Lim (Google) Deposition"); Deposition of Ruth Porat, Chief Financial Officer at Google, September 15, 2022 (hereafter "Porat (Google) Deposition"); Deposition of Paul Perryman, Vice President of Business Development and Partnerships at Netflix, September 28, 2022 (hereafter "Perryman (Netflix) Deposition"); Deposition of Eric Chu, Engineering Director at Meta Platforms and formerly Director of the Android Developer Ecosystem at Google, December 20, 2021, and January 14, 2022 (hereafter "Chu (Meta Platforms (formerly Google)) Deposition"); Deposition of Lawrence Koh, General Manager of FIFA Mobile at EA and formerly Director and Global Head of Games Business Development at Google, December 9, 2021 (hereafter "Koh (EA (formerly Google)) Deposition"); Deposition of Haseeb Malik, Director of Mobile Publishing at Epic Games, March 4, 2022 (hereafter "Malik (Epic Games) Deposition"); Deposition of Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, April 21, 2022 (hereafter "Brady (Google) Deposition"); Deposition of Richard Czeslawski, Developer Class Representative and Chief Operating Officer and President of Pure Sweat Basketball, March 21, 2022 (hereafter "Czeslawski (Pure Sweat Basketball) Deposition"); Deposition of Lacey Ellis, Developer Class Representative and Founder and CEO of LittleHoots LLC, March 22, 2022 (hereafter "Ellis (LittleHoots) Deposition"); Deposition of Hiroshi Lockheimer, Senior Vice President of Platforms & Ecosystems at Google, August 15-16, 2022 (hereafter "Lockheimer (Google) Deposition"); Deposition of Andrew Rubin, Co-founder of Android and formerly Senior Vice President, Mobile and Digital Content, at Google, May 17-18, 2022 (hereafter "Rubin (formerly Google) Deposition"); Deposition of Daniel Vogel, Chief Operating Officer at Epic Games, May 23, 2022, (hereafter "Vogel (Epic Games) Deposition"); Deposition of Jonathan Gold, Finance Manager for Android at Google, June 23-24, 2022 (hereafter "Gold (Google) Deposition"); Deposition of Kirsten Rasanen, formerly Business Development Director at Google, August 17, 2022 (hereafter "Rasanen (formerly Google) Deposition"); Deposition of Christopher Li, Director and Head of Product Growth at Google, May 24-25, 2022 (hereafter "Li (Google) Deposition"); Deposition of Mrinalini Loew, Product Lead for Google Play Commerce at Google, September 15, 2022 (hereafter "Loew (Google) Deposition"); Deposition of

jurisdictions, trade press, and structured data, including Google's proprietary data and third-party data from IDC, data.ai (formerly App Annie), Statcounter, and Statista, among others. Finally, I understand that my support team has had access to all materials produced in this matter via the Consumers' and States' document management database. A list of materials that I relied upon in forming my expert opinions described herein is attached as Appendix B.

8. The work presented in this report has been conducted by me and staff working under my direction at AlixPartners, a global consulting firm. I am compensated at a rate of $700 per hour for my work in this matter, and I receive additional compensation related to billings by staff at AlixPartners who assisted on this report at my direction and who continue to support my work in this matter. My compensation is not dependent on the outcome of this matter. My work is ongoing, and I will continue to review the discovery record to understand the evidence in this case. I reserve the right to supplement and to amend my opinions.[3]

II. Summary of Opinions

9. Based on my analyses summarized in this report, my review of the record evidence, and my experience as an industrial organization economist, I find that Google holds market power in two relevant antitrust markets, each of which is pertinent to evaluating the effects of Google's challenged conduct. The first is the market for the distribution of Android apps on Android smart mobile devices worldwide (excluding China) ("Android App Distribution Market"). The Android App Distribution Market includes the Google Play Store, the online app store through which Google

Edward Cunningham, Product Manager for Android at Google, July 21-22, 2022 (hereafter Cunningham (Google) Deposition"); Deposition of Nick Sears, Android Co-founder at Google, July 1, 2022 (hereafter "Sears (Google) Deposition"); Deposition of Jamie Rosenberg, Vice President of Strategy and Operations, Platforms and Ecosystems Division, at Google, July 14, 2020 (hereafter "Rosenberg (Google) Deposition 2020"); Deposition of Christopher Dury, CEO at GetJar, September 16, 2022 (hereafter "Dury (GetJar) Deposition"); Deposition of Sandra Alzetta, Vice President of Payments at Spotify, September 29, 2022 (hereafter "Alzetta (Spotify) Deposition"); Deposition of George Christopoulos, Founder at SlideMe, September 9, 2022 (hereafter "Christopoulos (SlideMe) Deposition"); Deposition of Donn Morrill, Director of Developer Relations for Entertainment Devices and Services at Amazon, August 11, 2022 (hereafter "Morrill (Amazon) Deposition"); and Deposition of Sebastian Porst, Security Engineering Manager at Google, July 13-14, 2022 (hereafter "Porst (Google) Deposition").

[3] For example, I understand that Google recently produced transaction data through May 2022. Due to the size of the production and due to the technical issues that have arisen in processing the data, I reserve my rights to update my analyses (including charts and appendices) to reflect the newly produced data.

distributes mobile apps for the Android operating system;, original equipment manufacturers ("OEMs") Android app stores (*e.g.*, the Samsung Galaxy Store); other third-party Android app stores (*e.g.*, the Amazon Appstore and F-Droid),; and sideloading (*i.e.*, downloading an app onto a smart mobile device directly from a developer's website). Those distribution channels could be competitively viable alternatives to the Google Play Store in the absence of Google's challenged conduct. I focus my report on smart mobile devices, which includes smartphones and tablets (devices that allow users to download, install, and run applications), but excludes e-readers, feature phones, and basic phones (which have more basic functionality).

10. The second relevant market for evaluating the competitive effects of Google's challenged conduct is the market for in-app billing services for purchases of digital in-app content through apps on Android smart mobile devices worldwide (excluding China) ("the Android In-App Billing Services Market"). There is a bundle of services associated with in-app digital content purchases, including payment processing, for which developers could reasonably use a variety of alternative independent service providers or self-serve. Developers who monetize in-app content require a billing service provider to receive payment and unlock the purchased in-app content, among other services. The billing service provider is a vendor to the developer, who requires In-App Billing Services to sell digital in-app content to Android smart mobile device users as part of the user experience the app provides. Thus, I find that the Android In-App Billing Services Market includes (i) Google Play Billing, (ii)) billing service systems provided by other Android app stores; (iii) developers' own billing service systems; and (iv) independent billing service providers.

11. Further, to identify the boundaries of the relevant markets, I perform a SSNIP analysis, which confirms that a small increase from a competitive commission and a small decrease from competitive direct discounts to consumers would be profitable for a hypothetical monopolist of Android App Distribution and In-App Billing Services. For my SSNIP analysis, I first ask whether Android App Distribution and Android In-App Billing Services Markets are defined too narrowly. I consider whether other possible alternatives, such as the Apple App Store, act as sufficient constraints on a hypothetical monopolist that they should be considered part of the relevant market. Therefore, I ask whether a hypothetical monopolist of both markets would find it profitable to impose a combined 10% SSNIP across Android App Distribution and Android In-App

Billing Services. To be clear, this does not mean that Android App Distribution and Android In-App Billing Services necessarily are in one broad single market. As stated in the *U.S. Merger Guidelines* jointly published by the U.S. Department of Justice and the Federal Trade Commission: "The hypothetical monopolist test ensures that markets are not defined too narrowly, but it does not lead to a single relevant market."[4] I find the 10% combined SSNIP on the Android App Distribution and In-App Billing Services Markets would be profitable and thus the combined market is not subject to any significant competitive constraints (such as the Apple App Store and associated billing services). I further demonstrate that Android App Distribution and In-App Billing Services are separate and distinct product markets. The products in these two relevant markets are complements (consumers and developers cannot have in-app content without distribution of the app), and they are two separate products with separate demand.

12. Based on a number of factors, I conclude the geographic market for both product markets is worldwide, excluding China. OEMs of Android smart mobile devices sign Mobile Application Distribution Agreements ("MADAs"), under which Google allows them to sell Android smart mobile devices with the Google Play Store pre-installed (and to license Google Mobile Services ("GMS")) in most parts of the world. Android developers can therefore reach a global audience regardless of their location. As developers want to reach as many users as possible, their incentive is to make their apps available globally. Many In-App Billing Service providers offer their services worldwide, or could do so absent Google's restraints. Android developers require In-App Billing Services to sell digital in-app content to customers worldwide (ex. China). Finally, the Google Play Store and Google Play Billing are unavailable in China.

13. I find that Google has market power in each of these markets. In each market, Google's market share exceeds 85% and is protected by significant barriers to entry, such as the installed base of the Android operating system (and its attendant indirect network effects) and contractual restrictions that thwart successful entry/expansion by would-be potential rivals. Google

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[4] U.S. Department of Justice and the Federal Trade Commission, "Horizontal Merger Guidelines," August 19, 2010, available at https://www.justice.gov/atr/horizontal-merger-guidelines-08192010, (hereafter, "*U.S. Merger Guidelines*"), p. 9.

also successfully imposes a supracompetitive commission and earns supracompetitive margins, which also show its market power.

14. I find that Google has monopolized each of these markets and impeded viable competition through various anticompetitive means. In the market for Android App Distribution, Google's conduct restricts rival Android app stores from entry and expansion in the three key distribution channels by which app stores can reach Android users: the Google Play Store, preloading, and sideloading. Google has signed restrictive contracts to share monopoly rents with mobile network operators ("MNOs") and OEMs, sharing their monopoly rents with them, to prevent the pre-installation of MNO, OEM, and third-party app stores and to promote the Google Play Store over these alternatives. Google requires in the challenged agreements with OEMs that the Google Play Store receive better or equal treatment to any other Android app store on applicable Android smart mobile devices, which creates barriers to rivals to obtain such placement or discovery from users. To further restrict competition from rival Android app stores and inhibit their installation on Android smart mobile devices, Google increased user friction by erecting a series of technological barriers to make sideloading appear less attractive, such as a cumbersome series of prompts and warning screens when users attempt to install an alternative app store on their Android smart mobile devices. By erecting roadblocks to each alternative method of Android App Distribution, Google prevents meaningful competition over the distribution of other Android app stores through the Google Play Store by foreclosing channels through which competitors could reach end-consumers, the Android users.

15. Google also paid developers in exchange for not launching their titles or features exclusively on other app stores. Google sought to cut off rival app stores' exclusive access to apps from high-value developers by offering incentive payments to developers. In turn, this reduced rivals' access to high-value consumers. Importantly, due to indirect network effects, if a rival is unable to compete for a share of developers, the rival will attract fewer consumers, and vice-versa. Indirect network effects thus magnify the impact of reduced competition on one side of a two-sided market with a corresponding effect on the other.

16. Through this combined course of conduct, Google has restricted competition by imposing barriers in each Android app distribution channel and maintained market power in in the market for Android App Distribution.

17. In the market for Android In-App Billing Services, Google has tied its Google Play Billing to app distribution through the Google Play Store, thus leveraging its market power in Android App Distribution into an adjacent market. Google's behavior satisfies the standard conditions for tying. Android In-App Billing Services, and particularly payment services, is a separate product for which there is both separate supply (rival firms willing to supply payment services for the purchases of in-app digital content) and separate demand (app developers that would like to use alternative Android In-App Billing Service providers (or their own services) but cannot because of the contract imposed by Google). There is no technological benefit to making the combination of these separate products mandatory – indeed, some developers report worse consumer experience using Google Play Billing and worse fraud detection. Google's own divisions, such as YouTube subscription services, refused to use Google Play Billing because it was inferior to its own service. Google has market power in the tying good (Android App Distribution) and a substantial share of the market for the tied good (Android In-App Billing Services) is foreclosed by this tie.

18. Furthermore, the tie has anticompetitive consequences. Competing Android In-App Billing Service providers may offer forms of payment that Google Play Billing does not, exposing developers to new monetization opportunities with new consumers using different forms of payment. By restricting developers' ability to monetize, Google shrinks its own Android ecosystem, and fewer developers enter to launch apps. [redacted].[5]

[5] GOOG-PLAY-006829073.R-172.R, at 157.R and 170.R-171.R [redacted]

19. I find that Google's monopolization of these markets through various anticompetitive means allowed Google to impose a substantial overcharge and caused harm to consumers —through higher net prices and lower variety and app availability. Whereas Google charges a 30% commission on most app distribution and in-app content purchases, it readily offered lower commissions when faced with even modest competitive pressure, often 15% or even lower. Based on an analysis of these benchmark commissions, I find that competition in the Android App Distribution and Android In-App Billing Services Markets would have led to total commission rates of 15% or lower.

20. To estimate damages to consumers derived from Google's anticompetitive conduct, I develop an economic model of Android app distribution and in-app billing services from existing economic literature. My model captures the fact that consumers care not just about the prices of apps and in-app content but also the variety of apps and in-app content available through the app store. In my model, app developers make profit-maximizing choices about prices and entry. The higher developers' potential margins, the more developers will enter, and the more choices and varieties of apps consumers will have. Higher Android app store commission rates and lower consumer discounts increase net prices to consumers, reduce profits to app developers, increase app exit, and block new app entry, which reduces the app variety available to consumers.

21. I calibrate the model based on Google Play Store transaction data provided by Google to recover suitable parameters and formulae for SSNIP and damages quantifications. For consumer demand elasticity, my regression results are generally consistent with the consumer

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[redacted] *See also* Marchak (Google) Deposition, pp. 4731-4759 [redacted]

demand elasticity calculated for the Google Play Store from the academic literature. For this parameter, I rely on the elasticity from the economic literature because it leads to a more conservative calculation of damages.

22. I use the model to estimate damages to consumers due to the high commission and low direct discounts to consumers that Google imposed through the Google Play Store as a result of its anticompetitive arrangements. My damages calculations accounts for the effects of Google's high commissions and low discounts on the prices that consumers pay and the variety of apps and in-app content from which they may select. I provide several measures of damages that variously hold entry constant, hold prices constant, or allow for a total effect on consumer welfare in response to Google's high commissions and low discounts. While the total welfare effect accounts for all the economic effects of the high commissions and low discounts, to be conservative I take the minimum of the total welfare damages and variety damages, where, in the latter, I hold the price constant. In other words, in my variety damages, I assume that app and in-app prices do not change at all in response to a reduction in Google's commission and that developers keep 100% of the commission reduction that would obtain in the but-for world. With that assumption, I find variety damages in the Android App Distribution and Android In-App Billing Services Markets of roughly [redacted] for the period August 16, 2016, to June 5, 2023 ("the damages period").[6] I can also use the model to calculate the variety effect damages associated with Google Play Billing only, which I find to be approximately [redacted].

23. Overall, I find compelling evidence that Google has monopolized the markets for Android App Distribution and Android In-App Billing Services through a variety of anticompetitive acts. Despite employing a number of conservative assumptions, I find that Google has market power in two relevant markets, generated significant harm to competition, and substantially harmed consumers.

24. The remainder of this report details the analyses underlying my opinions. In Section III, I provide background information relevant to evaluating the challenged conduct in this matter,

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[6] I have been instructed by counsel to use these date ranges for my calculations.

which guided my analysis. Section IV describes the Google business entities operating in the markets at issue, the relevant Google contractual agreements, as well as details of its challenged conduct. In Sections V and VI, I present my analysis of market definition for the two relevant markets and summarize evidence of Google's market power in these markets. In Sections VII and VIII, I present evidence that Google's challenged conduct has harmed competition in the Android App Distribution and Android In-App Billing Markets through increased prices, lowered output, and reduced innovation. In Section IX, I summarize my damages model and present my estimate of damages to consumers. Section X concludes.

III. Mobile Ecosystems and the Digital Economy

25. To assess whether and to what extent Google has monopolized Android App Distribution and Android In-App Billing Services, I start by describing the economic elements of mobile ecosystems: the relevant technologies, including mobile devices, mobile operating systems, and mobile applications ("apps"); the development of mobile applications and the role of app developers; the means by which developers can distribute apps to consumers; and the function of billing services for in-app purchases of digital content.

A. Mobile Technology

1. Mobile Devices, OEMs, and MNOs

26. Mobile devices are handheld, portable computing devices that provide mobile (cellular or wireless) network access.[7] Mobile devices support various functions, such as communicating through voice calls and text messages, taking photographs or videos, browsing the internet with cellular or wireless networks, sharing mobile applications, and streaming music and

[7] National Institute of Standards and Technology, "Mobile Device," available at csrc.nist.gov/glossary/term/mobile_device.

videos.[8] Mobile devices include, for example, smartphones, tablets, and e-readers, as well as basic phones and "feature phones" which generally offer a few services such as voice calling, text messaging, and limited web browsing.[9]

27. Smartphones are cell phones that run on a mobile operating system ("OS") with advanced features, such as a high-resolution touch screen that displays an interactive user interface, a built-in camera for taking photos and videos, global positioning system ("GPS") functionality, and the ability to download and run sophisticated applications.[10] Smartphones generally have more processing power and storage space, as well as greater connectivity options, than basic or feature

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[8] National Institute of Standards and Technology, "Mobile Device," available at csrc.nist.gov/glossary/term/mobile_device; IBM, "What is mobile technology?" available at https://www.ibm.com/topics/mobile-technology; and Verizon, "Top 10 Things to Do with Your New Smartphone," available at https://www.verizon.com/support/top-ten-things-to-do-with-your-smartphone/ and Google, "Send and receive text messages (SMS & MMS)," available at https://support.google.com/fi/answer/6205096?hl=en&co=GENIE.Platform%3DAndroid.

[9] National Institute of Standards and Technology, "Mobile Device," available at csrc.nist.gov/glossary/term/mobile_device. E-readers (*e.g.*, the Amazon Kindle or Kobo Libra) are designed for reading digital books and magazines. Basic phones (*e.g.*, the Alcatel One Touch or Samsung Gusto 3) are standard cell phones with two basic functions: voice calls and text messages. Feature phones (*e.g.*, the Nokia 8000 or TTfone Titan) have some multimedia and internet capabilities in addition to voice calling and text message functions. They typically have a simple graphical user interface with non-touch displays and do not support additional applications. *See*, *e.g.*, Giordano, Medea, "The Best Ebook Readers," WIRED, August 7, 2022, https://www.wired.com/gallery/best-ereaders/, DeviceAtlas, "Feature Phones in the USA," available at https://deviceatlas.com/blog/feature-phones-statistics-usa, LaMarco, Nicole, "The 5 Best Basic Cell Phones of 2022," Lifewire, February 9, 2022, available at https://www.lifewire.com/basic-cell-phones-577534; McCrocklin, Shannon, "Basic Phones, Feature Phones, and Smartphones for Research in Emerging Markets," GeoPoll, July 30, 2019, available at https://www.geopoll.com/blog/basic-phones-feature-phones-and-smartphones-for-research-in-emerging-markets/#Feature_Phones_for_Market_Research_in_Emerging_Markets; Techopedia, "E-book Reader," 2021, available at techopedia.com/definition/25200/e-book-reader; Techopedia, "Feature Phone," February 5, 2016, available at techopedia.com/definition/26221/feature-phone; and PCMag, "Definition of feature phone," available at https://www.pcmag.com/encyclopedia/term/feature-phone#:~:text=A%20cellphone%20that%20contains%20a,as%20extensive%20as%20a%20smartphone ("feature phone[:] A cellphone that contains a fixed set of functions beyond voice calling and text messaging but is not as extensive as a smartphone. For example, feature phones may offer Web browsing and email, but they generally cannot download apps from an online marketplace").

[10] Encyclopedia Britannica, "smartphone," August 12, 2022, available at https://www.britannica.com/technology/smartphone; and Gutierrez, Anthony, Ronald G. Dreslinski, Thomas F. Wenisch, Trevor Mudge, Ali Saidi, Chris Emmons, and Nigel Paver, "Full-System Analysis and Characterization of Interactive Smartphone Applications," IEEE Int. Symp. on workload Characterization, November 6-8, 2011, pp. 81-90, available at http://tnm.engin.umich.edu/wp-content/uploads/sites/353/2017/12/2011.10.Full-System-Analysis-and-Characterization-of-Interactive-Smartphone-Applications.pdf, at p. 1.

phones. Smartphones are also "equipped with innovative sensors" to display screens in portrait and landscape mode, and support motion-based navigation.[11]

28. Similar to smartphones, tablets (*e.g.*, the Apple iPad, Samsung Galaxy Tab, or Lenovo Tab) are touchscreen mobile devices that have Wi-Fi and cellular connectivity and the ability to accept sophisticated applications, and are primarily used for web browsing, games, or streaming music or videos, but are larger in size than smartphones.[12] Tablets differ from laptops; for example, tablets tend to be "[s]maller and lighter" (and thus more portable) and "[d]esigned for media consumption," whereas laptops tend to be "[m]ore powerful," "typically have more features," and are "[d]esigned for productivity."[13]

29. For the remainder of this report, I use the term "smart mobile devices" to mean smartphones and tablets, because a defining feature of smartphones and tablets is that they are general computing devices that let users to download, install, and run applications, while non-smart

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[11] Techopedia, "Smartphone," February 25, 2019, available at techopedia.com/definition/2977/smartphone.

[12] Google, "Understanding Tablet Users," November 2016, GOOG-PLAY-000092281.R-330.R at 299.R ([redacted]); Lifewire, December 6, 2021, available at https://lifewire.com/tablets-vs-laptops-832333; PCMag, "Tablet," available at https://www.pcmag.com/encyclopedia/term/tablet; Verizon, "What's the Difference Between Wi-Fi Data and Cellular Data," May 6, 2021, available at https://www.verizon.com/articles/verizon-unlimited-plans/whats-the-difference-between-wifi-data-and-cellular-data/; Walker-Todd, Alex, "Best tablet 2022: the top tablets you can buy right now," *TechRadar*, September 14, 2022, available at https://www.techradar.com/news/best-tablet; and Geralt, Andrei, "Tablets vs smartphones: Which one is more enterprise worthy?" *Hexnode*, July 8, 2021, available at https://www.hexnode.com/blogs/tablets-vs-smartphones-which-one-is-more-enterprise-worthy/.

[13] Kyrnin, Mark, "Should You Buy a Tablet or a Laptop? A comparison of smart tablets and laptop computers," *Lifewire*, April 12, 2021, available at https://lifewire.com/tablets-vs-laptops-832333. So-called "2-in-1" computers (*e.g.*, the Microsoft Surface) offer features of both tablets and laptops, such as detachable keyboards and higher processing power. *See*, *e.g.*, Microsoft, "Surface Pro 8," available at https://www microsoft.com/en-gb/d/surface-pro-8/8qwcrtq8v8xg?activetab=pivot%3aoverviewtab; Wired, "Here Come the Hybrid 'Laplets.' Should You Care?" October 17, 2012, available at https://www.wired.com/2012/10/windows8-laplet-hybrid/; and Motorola Mobility, "[redacted]," March 10, 2021, [redacted].

mobile devices are not general purpose and do not support user-installed applications through an online app distribution platform.[14]

30. Since the introduction of Blackberry phones in the early 2000s and the Apple iPhone in 2007, smartphones have become ubiquitous in the United States and worldwide.[15] In 2021, U.S. smartphone sales were expected to surpass $70 billion, compared to under $9 billion in 2007[16], and, by 2021, 85% of Americans owned a smartphone, up from just 35% in 2011.[17] The number of smartphone users worldwide surpassed 6.2 billion in 2021 (approximately 78% of the worldwide population) and is projected to reach 7 billion in 2024.[18] Tablet ownership among U.S. consumers has also increased significantly from 8% in 2011 to 53% in 2021.[19]

31. Companies that design or manufacture smartphones and tablets are referred to as original equipment manufacturers or OEMs. Apple, Samsung, LG, and Lenovo/Motorola are among

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[14] See Techopedia, "Feature Phone," February 5, 2016, available at techopedia.com/definition/26221/feature-phone. Although some feature phones have pre-installed essential apps, such as WhatsApp, Facebook, and Google Maps for basic functionalities, users cannot download or install other sophisticated apps with interactive features on these devices. *See*, *e.g.*, Nokia "Feature Phone – Nokia 8000 4G," available at https://www nokia.com/phones/en_gb/nokia-8000-4g?sku=16LIOW01A05. *See* Section V.C.4 for additional information on the differences between feature phones and smartphones. In addition, Google's aggregated data on app revenues shows that for apps and in-app purchases, the share of consumer spend on tablets over the total consumer spend on all smart mobile devices was between 9.3% and 13.9% in the U.S. during 2017-2021. This indicates consumers consider tablets as complements to smartphones for downloading apps and using apps. *See* Rysman Workpapers.

[15] *See*, *e.g.*, Davies, Hannah, "RIP BlackBerry: A timeline of every great BlackBerry phone we reviewed," *Trusted Reviews*, January 7, 2022, available at https://www.trustedreviews.com/opinion/rip-blackberry-a-timeline-of-every-great-blackberry-phone-we-reviewed-4194746; and Montgomery, April, and Ken Mingis, "The evolution of Apple's iPhone," *Computerworld*, September 23, 2021, available at https://www.computerworld.com/article/2604020/the-evolution-of-apples-iphone html.

[16] *See*, *e.g.*, Statista, "Smartphone sales forecasts in the United States from 2005 to 2022," August 11, 2022, available at https://www.statista.com/statistics/191985/sales-of-smartphones-in-the-us-since-2005.

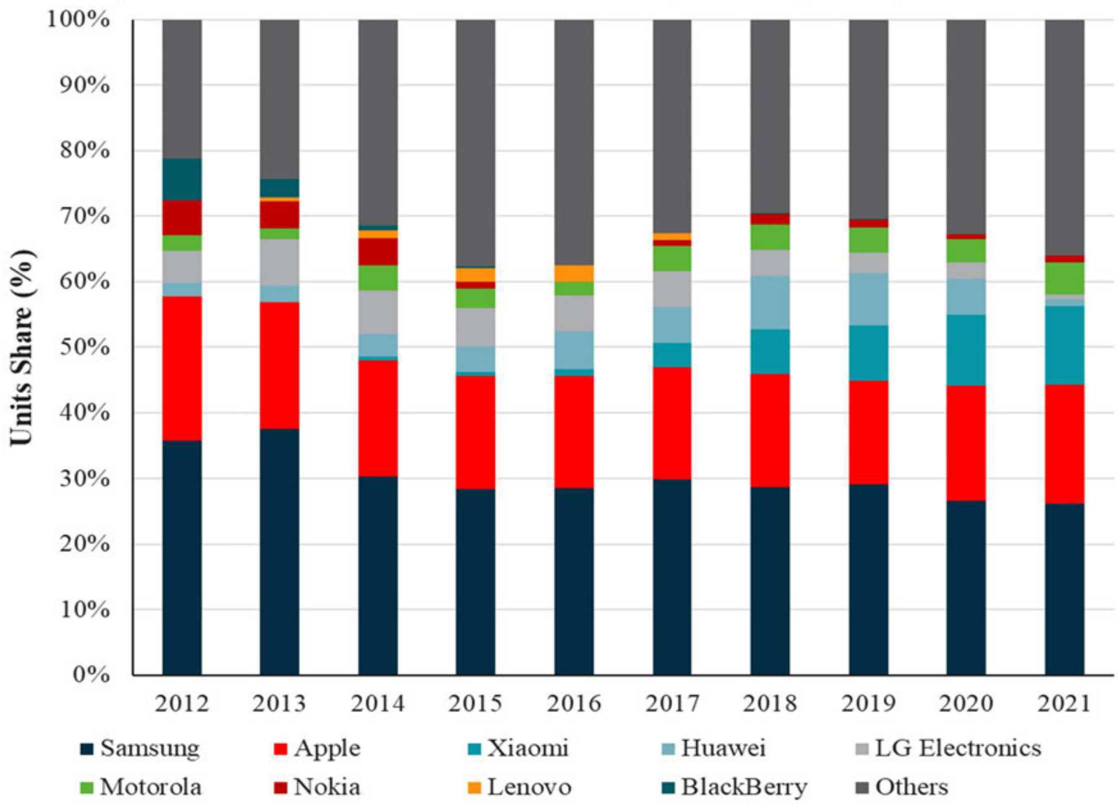
[17] *See*, *e.g.*, Pew Research Center, "Mobile Fact Sheet," April 7, 2021, available at pewresearch.org/internet/fact-sheet/mobile/.

[18] Note the worldwide smartphone users include China. *See* Statista, "Number of smartphone subscriptions worldwide from 2016 to 2027," July 27, 2022, available at https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/; The world population in 2021 was almost 7.9 billion. United Nations, "World Population Day," available at https://www.un.org/en/observances/world-population-day.

[19] *See*, *e.g.*, Pew Research Center, "Mobile Fact Sheet," available at pewresearch.org/internet/fact-sheet/mobile/.

the largest OEMs in terms of U.S. smartphone market share.[20] Google sells its own smart mobile devices, primarily the Pixel smartphones and tablets.[21] OEM market shares for smartphones are depicted in Exhibit 1 below. This shows that OEM market shares have been dynamic during that timeframe. Larger players in 2012 (including Nokia, LG and Blackberry) had shares below 2% by 2021.

Exhibit 1
Smartphone OEM Market Shares Worldwide (excluding China), 2012 – 2021



Source: IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.

32. Smart mobile devices rely on cellular and wireless fidelity ("Wi-Fi") technology to communicate. The cellular network is a high-capacity communication network distributed over cell

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[20] *See* O'Dea, S., "United States (U.S.) market share of smartphone original equipment manufacturers (OEMs) in the 1st quarter 2021," *Statista*, July 12, 2021, available at https://statista.com/statistics/1187356/smartphone-original-equipment-manufacturers.

[21] *See* Jobanputra, Soniya, "Pixel 6a: More of what you want for less than you expect," *Google*, May 11, 2022, available at https://blog.google/products/pixel/pixel-6a-io-2022/.

sites that enables wireless transmission of voice calls and data.[22] A wireless standard defines the protocols for communication between the different components of a cellular network such as the base stations and mobile devices themselves.[23] Standard-setting organizations around the world have developed common wireless cellular systems, which have advanced in subsequent releases known as generations.[24] Since the introduction of the second generation ("2G") digital cellular system in the early 1990s,[25] "[s]ignificant advances were made with the introduction of third generation ('3G') mobile broadband in the early 2000s, and innovation continue[d] … with much faster and efficient wireless fourth ('4G') and … fifth generation ('5G') systems."[26] "Utilization of the mobile wireless networks for internet browsing, emailing, gaming, and mobile applications would not be possible without the high data rates enabled by core communications technology incorporated in the cellular standards."[27]

33. As smartphone adoption grew, so did the adoption of mobile internet services. The number of mobile subscribers reached 327 million (83% of the region's population) by 2020 in

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[22] *See*, *e.g.*, Samsung, "What is a Cellular network or Mobile network?" October 27, 2020, available at https://www.samsung.com/in/support/mobile-devices/what-is-a-cellular-network-or-mobile-network/; Long, Moe, "What is Mobile Data? Everything You Need to Know," *WhistleOut*, April 15, 2022, available at https://www.whistleout.com/CellPhones/Guides/mobile-data; and Hardesty, George, "Cellular Wireless Technologies: 5G, LTE / 4G, GSM / 3G, 2G and 6G," *Data Alliance*, September 11, 2020, available at https://www.data-alliance.net/blog/cellular-wireless-technologies-5g-lte-4g-gsm-3g-2g-and-6g/.

[23] IEEE Standard Association, "What are Standards? Why are They Important?" January 11, 2021, available at https://beyondstandards.ieee.org/what-are-standards-why-are-they-important/ ("Standards form the fundamental building blocks for product development by establishing consistent protocols that can be universally understood and adopted. This helps fuel compatibility and interoperability and simplifies product development, and speeds time-to-market.") and Kernighan, Brian W., *Understanding the Digital World: What You Need to Know About the Internet, Privacy, and Security*, First Edition, Princeton, NJ: Princeton University Press, 2017, at p. 132 ("Phones talk to the closest base station, and when they move from one cell to another, a call in progress is handed off from the old base station to the new one […]. Cell sizes vary, from a few hundred meters to a few tens of kilometers.").

[24] 3GPP, "About 3GPP," available at https://www.3gpp.org/about-3gpp ("The 3GPP technologies from these groups are constantly evolving through Generations of commercial cellular / mobile systems. With LTE and 5G work, 3GPP has become the focal point for the vast majority of mobile systems beyond 3G. Although these Generations have become an adequate descriptor for the type of network under discussion, real progress on 3GPP standards is measured by the milestones achieved in particular Releases."). *See also* Gupta, Kirti, "Technology Standards and Competition in the Mobile Wireless Industry," *George Mason Law Review*, Vol. 22, 2014-2015, pp. 865-874 (hereafter "Gupta (2014-2015)"), at p. 865 and p. 874.

[25] Gupta (2014-2015), p. 865.

[26] Gupta (2014-2015), p. 865.

[27] Gupta (2014-2015), p. 874.

North America with the 4G network accounting for 87% of mobile internet connections.[28] Globally, the total number of mobile subscribers reached 5.1 billion (66% of population) in 2018 and is expected to grow to 5.7 billion (71% of population) by 2023.[29]

34. Providers of cellular networks are called MNOs or "carriers." The leading MNOs in the U.S. are AT&T, Verizon, and T-Mobile, which had a combined market share of 98.9% in the last quarter of 2021.[30] MNOs often collaborate with OEMs and OS developers to ensure mobile device users can access mobile services such as voice calls and internet data on their devices.[31] Meanwhile, the adoption of mobile internet has been increasing quickly.[32] In addition, and as discussed further in Section IV.B.5 below, carriers may also be involved in app distribution and in-app payments in the form of billing services.

2. Mobile Operating Systems

35. OEMs install mobile OSs on mobile devices to support general purpose functions such as access to cameras, internet connections, voice and text communications, as well as the installation, operation, and update of native mobile applications.[33] [redacted]

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[28] *See*, *e.g.*, GSMA, "The Mobile Economy North America 2021," available at https://www.gsma.com/mobileeconomy/wpcontent/uploads/2021/10/GSMA_ME_NorthAmerica_2021_Infographics_Spreads.pdf.

[29] *See*, *e.g.*, Cisco, "Cisco Annual Internet Report (2018–2023) White Paper," March 9, 2020, available at https://www.cisco.com/c/en/us/solutions/collateral/executive-perspectives/annual-internet-report/white-paper-c11-741490.html.

[30] *See*, *e.g.*, Statista, "Wireless subscriptions market share by carrier in the U.S. from 1st quarter 2011 to 2nd quarter 2022," September 9, 2022, available at https://www.statista.com/statistics/199359/market-share-of-wireless-carriers-in-the-us-by-subscriptions/.

[31] *See*, *e.g.*, Verizon, "Smartphones. Do More of the Things You Love," available at https://web.archive.org/web/20120301094107/http:/www.verizonwireless.com/b2c/explore/?page=smartphones; and Brady (Google) Deposition, pp. 160-161 (describing [redacted] with [redacted].

[32] *See* Pew Research Center, "Mobile Fact Sheet," April 7, 2021, available at pewresearch.org/internet/fact-sheet/mobile/.

[33] *See*, *e.g.*, Steele, Colin, "Mobile operating system," *TechTarget,* March 2020, available at https://www.techtarget.com/searchmobilecomputing/definition/mobile-operating-system. *See also* Tanenbaum, Andrew and Herbert Bos, *Modern Operating Systems*, Fourth Edition (Global Edition), London, UK: Pearson Education Limited, 2015, pp. 19-20, at pp. 19-20.

[redacted].[34] For the remainder of this report, I use the term "smart mobile OSs" as OSs designed specifically for smartphones and tablets (*i.e.*, smart mobile devices) that have advanced functionality such as a touchscreen user interface.

36. Broadly speaking, smart mobile OSs on smartphones and tablets can be proprietary or licensable. Proprietary (*i.e.*, non-licensable) smart mobile OSs are developed and used exclusively by a particular OEM. Notably, Apple has developed its own proprietary smart mobile OS called iOS, which is available for use exclusively on iPhones and iPads.[35] Companies such as Google and Microsoft developed mobile OSs and license them (or make them available) to third-party OEMs for installation on their smart mobile devices.[36]As shown in Exhibit 3 below, most smart mobile devices today run a licensable OS, which is mainly Android.[37]

37. As described in Section IV.A.1, the first mobile device with the Android OS shipped in the fall of 2008. As presented in Exhibit 2 below, since 2013, over 70% of smartphones

[34] Email from Monma Junichi, Google, to Toru Kawamura, Google, "[redacted]," December 16, 2014, GOOG-PLAY-000450926-931, at 927 ([redacted]). [redacted]. *See* Email from to Unsuk Jung, Google, to Pranab Mookken, Google, "Subject: Re: Device approval?" April 18, 2018, GOOG-PLAY-000433886.R-891.R, at 887.R ([redacted]). *See also* Sirois, Sophie, "How Do Touch Screens Work on Laptops and Tablets?" *HP,* December 12, 2018, available at https://www.hp.com/us-en/shop/tech-takes/how-do-touch-screens-work; and Computer World, "Nokia unveils trio of touchscreen feature phones," June 6, 2012, available at https://www.computerworld.com/article/2504064/nokia-unveils-trio-of-touchscreen-feature-phones html.

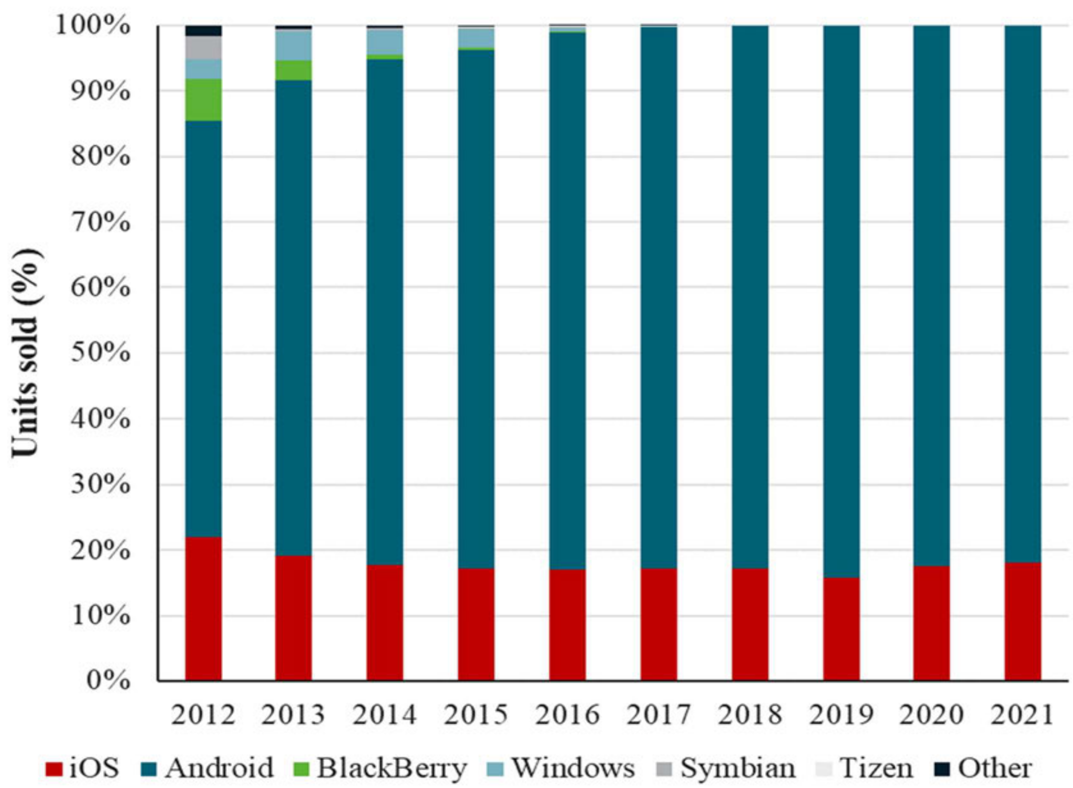
[35] Investopedia, "Apple iOS," October 25, 2021, available at https://www.investopedia.com/terms/a/apple-ios.asp. Although iPads for many years ran a variant the iOS used in smart phones, Apple renamed the mobile OS designed for iPads as "iPadOS" in 2019. For purposes of this report, I use "iOS" to refer to both iOS and iPadOS. *See* Wuerthele, Mike, "Apple unveils iPadOS, adding features specifically to iPad," Apple Insider, June 3, 2019, available at https://appleinsider.com/articles/19/06/03/apple-supplements-ios-13-with-new-tablet-specific-ipad-os-branch.

[36] Google, "Androids: The Team that Built the Most popular Operating System Ever," GOOG-PLAY-004456799-269, at 044 ("[redacted]"); and Vaughan-Nichols, Steven, "Debunking four myths about Android, Google, and open-source," *ZDNet,* February 18, 2014, available at https://www.zdnet.com/article/debunking-four-myths-about-android-google-and-open-source/.

[37] *See also* "Google Android," European Commission Directorate-General of Competition, Case No. AT.40099, European Commission Decision, July 18, 2018 (hereafter "EC Google Android Decision"), at ¶ 446.

worldwide (excluding China) use Google's Android OS, with the figure reaching 82% in 2021.[38] Exhibit 2 below also shows the expansion of Android's market share worldwide from 2012 to 2021; Android's share of smartphones sold worldwide grew from around 63% to 82%, while iOS's share remained between 16% to 22%.

Exhibit 2
Smart Mobile OS Market Shares Worldwide (excluding China), 2012 – 2021



Source: IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.

38. Exhibit 3 below, which depicts Android's market share in the U.S. from 2012 to 2021, shows that, unlike the worldwide market, Android's share of smartphones sold in the U.S. has fluctuated between 51% and 62% during this period, and iOS's share has grown from 40% in 2012 to 48% by 2021.

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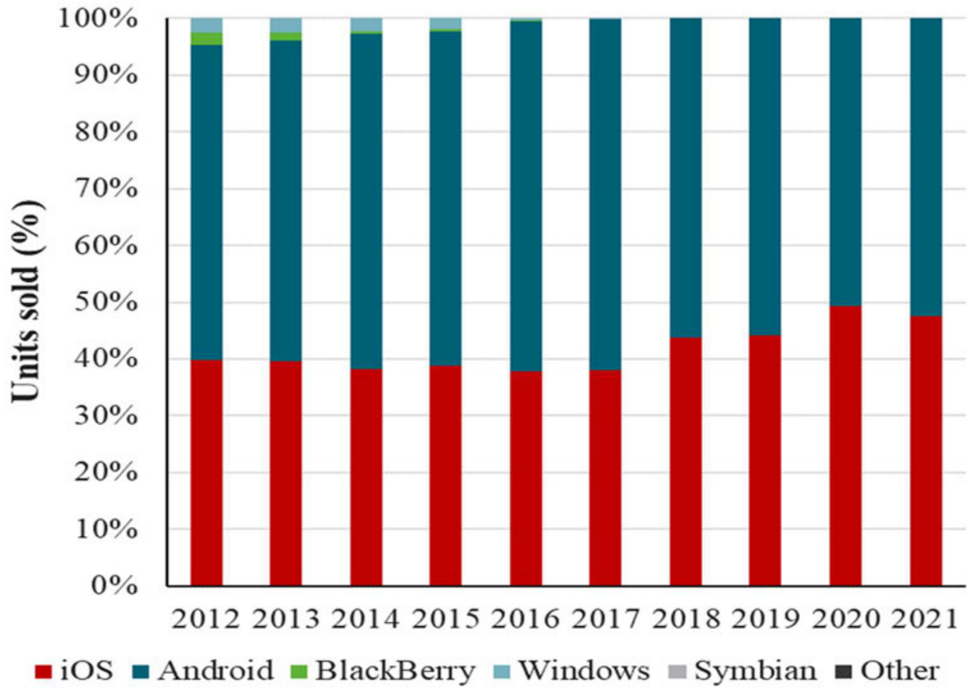
[38] Reynolds, Matt, "If you can't build it, buy it: Google's biggest acquisitions mapped," *Wired*, November 25, 2017, available at https://www.wired.co.uk/article/google-acquisitions-data-visualisation-infoporn-waze-youtube-android.

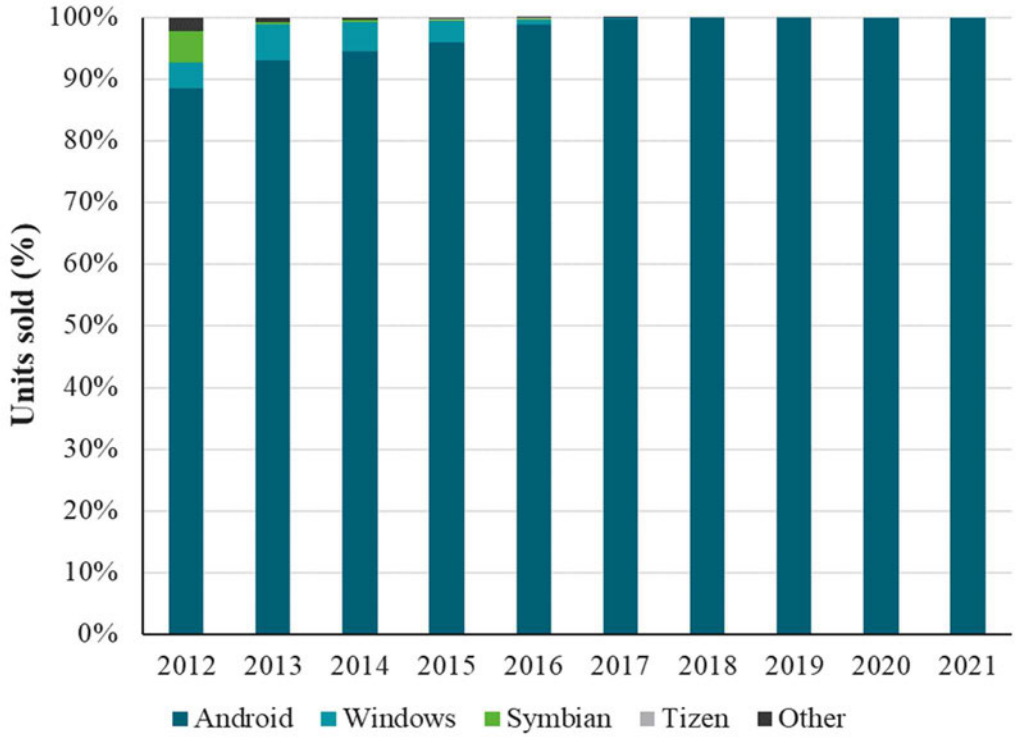
Exhibit 3
Smart Mobile OS Market Shares in the U.S., 2012 – 2021



Source: IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.

39. Exhibit 4 below shows that, within licensable smart mobile OSs (*i.e.*, removing iOS and BlackBerry OS from Exhibit 2 above), Android's share of smart mobile devices sold worldwide (excluding China) increased from around 89% in 2012 to 99% by 2017 and beyond.

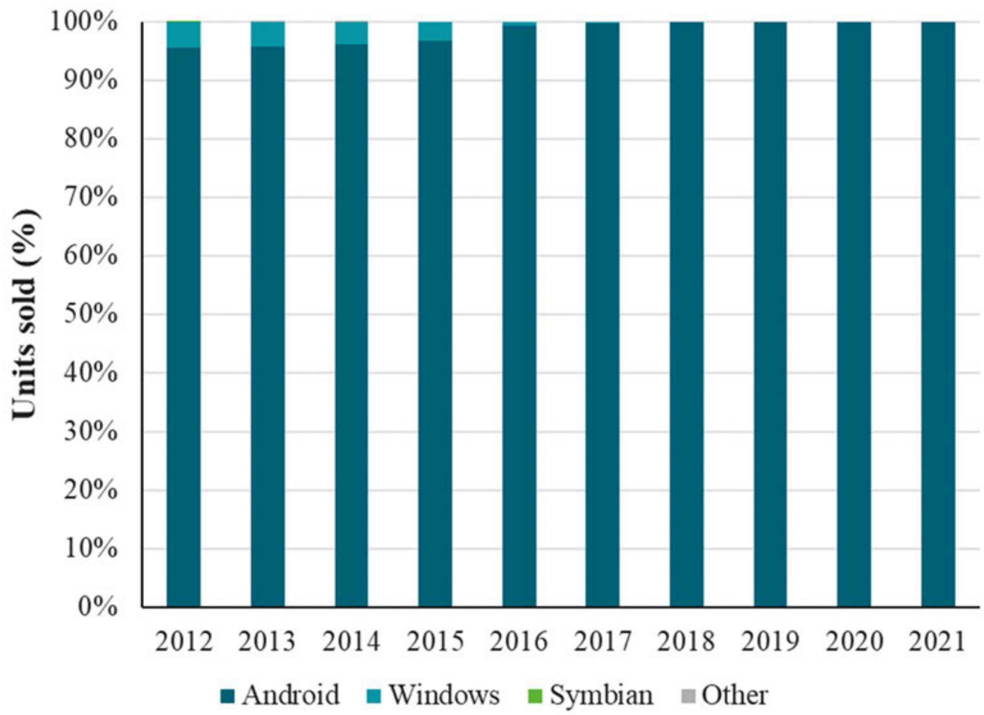
Exhibit 4
Licensable Smart Mobile OS Market Shares Worldwide (excluding China), 2012 – 2021



Source: IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.

40. Similarly, Exhibit 5 below shows that within licensable smart mobile devices sold in the U.S., Android's share increased from 96% in 2012 to 100% by 2018, a share it has maintained through 2021.

Exhibit 5
Licensable Smart Mobile OS Market Shares in the U.S., 2012 – 2021



Source: IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.

3. *Mobile Applications*

41. A mobile application or "app" is software separate from the mobile OS that runs on a smart mobile device and adds specific functionalities to the device. Once an app is installed on a smart mobile device, the device displays the app's icon in the user interface and the user taps the icon to run the app.[39] Even basic mobile device functionality like the dialer (i.e., phone app)[40] and contacts list are, in fact, applications separate from the OS.[41] Around 3.5 million different

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[39] Mroczkowska, Agnieszka, "What is a Mobile App? | App Development Basics for Businesses," *Droids on Roids*, February 1, 2021, available at https://www.thedroidsonroids.com/blog/what-is-a-mobile-app-app-development-basics-for-businesses.

[40] Android, "Overview," August 2, 2022, available at https://source.android.com/docs/devices/automotive/hmi/dialer.

[41] Google, "Android-Platform-Packages-Apps," available at https://android.googlesource.com/platform/packages/apps/ (explaining that the Contacts app contains the "UI for the Contacts, Call log, and Dialer applications").

applications were available for download on Android smart mobile devices in 2021.[42] In 2020, according to data from data.ai (formerly App Annie), there were over 90.4 billion application downloads on from the Google Play Store, and Android users spent $27.1 billion on mobile applications (both initial downloads and in-app content) on the Google Play Store, an increase of 23.7% percent in terms of revenue compared to 2019.[43] According to data from data.ai, the vast majority (99.9% in 2020) of Android applications downloaded from the Google Play Store were free.[44]

42. There are many categories of apps, and, according to Google, 83% of apps on the Google Play Store in the first quarter of 2022 were not gaming apps.[45] Common types of apps include social media (*e.g.*, TikTok and Instagram), video streaming apps (*e.g.*, YouTube and Disney Plus), food and drinks (*e.g.*, DoorDash), and travel (*e.g.*, Airbnb and Uber), among others.[46] The most downloaded Android apps from the Google Play Store worldwide in 2020 were WhatsApp, TikTok, Instagram, Zoom, Facebook, Google Meet, and Snapchat.[47] The largest Android apps worldwide in terms of revenue are Google One (forecast to capture over $1 billion consumer spending in 2021), Piccoma, Disney Plus, TikTok, and HBO Max.[48] As shown in Exhibit 6, in the

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[42] *See*, *e.g.*, Ceci, L., "Number of apps available in leading app stores as of 2nd quarter 2022," *Statista*, August 11, 2022, https://www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/.

[43] *See* Rysman Workpapers. For 2021 figures, *see also*, *e.g.*, Chan, Stephanie, "Global Consumer Spending in Mobile Apps Reached $133 Billion in 2021, Up Nearly 20% from 2020," *SensorTower*, December 7, 2021, available at https://sensortower.com/blog/app-revenue-and-downloads-2021.

[44] *See* Rysman Workpapers.

[45] For example, according to Play Console Help, Google has 32 app categories. *See* Google, "Choose a category and tags for your app or game," available at https://support.google.com/googleplay/android-developer/answer/9859673?hl=en#zippy=%2Capps%2Cgames. In addition, Google's monthly app revenue data includes 35 app categories and 18 game categories. *See* Rysman Workpapers. Also, in the first quarter of 2022, the number of gaming apps on the Google Play Store is about 449,000 out of 2.592 million apps in total. *See* Clement, J., "Number of available gaming apps in the Google Play Store from 1st quarter 2015 to 2nd quarter 2022," *Statista*, August 30, 2022, available at https://www.statista.com/statistics/780229/number-of-available-gaming-apps-in-the-google-play-store-quarter/ and Ceci, L., " Number of available applications in the Google Play Store from December 2009 to March 2022," *Statista*, July 27, 2022, available at https://www.statista.com/statistics/266210/number-of-available-applications-in-the-google-play-store/.

[46] *See*, *e.g.*, Data.ai, "State of Mobile 2022," available at https://www.data.ai/en/go/state-of-mobile-2022.

[47] *See* Rysman Workpapers.

[48] *See*, *e.g.*, Chan, Stephanie, "Global Consumer Spending in Mobile Apps Reached $133 Billion in 2021, Up Nearly 20% from 2020," *Sensor Tower*, December 7, 2021, available at https://sensortower.com/blog/app-revenue-and-downloads-2021.

U.S., the three most popular apps in terms of installations are TikTok, YouTube, and Facebook, and YouTube, Tinder, and HBO Max are ranked the top three in terms of consumer spend.

Exhibit 6
Rank of Apps in the U.S. by Downloads, Consumer Spend, and Active Users, 2021

United States

DOWNLOADS			CONSUMER SPEND			MONTHLY ACTIVE USERS		
1	TikTok	Short Videos (Entertainment)	1	YouTube	Video Sharing (Entertainment)	1	Facebook	Social Networks (Social Media)
2	YouTube	Video Sharing (Entertainment)	2	Tinder	Dating (Social Media)	2	Facebook Messenger	Communication (Social Media)
3	Facebook	Social Networks (Social Media)	3	HBO Max	OTT (Entertainment)	3	Amazon	E-Commerce (B2C) (Shopping)
4	Instagram	Media Sharing Networks (Social Media)	4	Disney+	OTT (Entertainment)	4	Instagram	Media Sharing Networks (Social Media)
5	Facebook Messenger	Communication (Social Media)	5	Pandora Music	Music & Audio (Entertainment)	5	TikTok	Short Videos (Entertainment)
6	ZOOM Cloud Meetings	Meeting (Business)	6	Twitch	Live Streaming (Entertainment)	6	Snapchat	Media Sharing Networks (Social Media)
7	Cash App	Digital Wallets & Payment (Finance)	7	TikTok	Short Videos (Entertainment)	7	Netflix	OTT (Entertainment)
8	Netflix	OTT (Entertainment)	8	Google One	File Management (Utility & Productivity)	8	Spotify	Music & Audio (Entertainment)
9	HBO Max	OTT (Entertainment)	9	Bumble App	Dating (Social Media)	9	Pinterest	Media Sharing Networks (Social Media)
10	Snapchat	Media Sharing Networks (Social Media)	10	Hulu	OTT (Entertainment)	10	WhatsApp Messenger	Communication (Social Media)

Note: The data are combined iOS and Google Play.

Source: Data.ai, "State of Mobile 2022," available at https://www.data.ai/en/go/state-of-mobile-2022.

B. Development of Mobile Applications

43. App developers are the designers, builders, testers, and distributors of apps, ranging from large enterprises to single individuals.[49] Developers design apps "with the limitations and features of mobile devices in mind. For example, a game could make use of a smartphone's accelerometer, or a drawing pad app could make use of a tablet's stylus."[50] To function, mobile applications must be written in a programming language compatible with the mobile device OS. Different mobile operating systems require different programming languages. For example,

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[49] *See*, *e.g.*, Subramaniam, Pia, "Top App Development Companies (2022)" *Business of Apps*, September 19, 2022, available at https://www.businessofapps.com/app-developers/.

[50] *See*, *e.g.*, Ceci, L., Statista, "Mobile app usage - Statistics & Facts," *Statista*, October 14, 2021, available at statista.com/topics/1002/mobile-app-usage. An accelerometer on a smart mobile device is "a sensor that enables users with an upgraded experience by adjusting an orientation of the app screen in the smartphone and tablet. The core objective of the mobile phone accelerometer is, the device adapts the orientation as per the device position from horizontal to vertical and vice-versa. To provide a comfortable viewing experience to the users, it measures the position and orientation change of the screens." *See* Sharma, Sagar, "What is Accelerometer? How to Use Accelerometer in Mobile Devices," *Credencys*, July 2, 2020, available at https://www.credencys.com/blog/accelerometer/.

converting an Android app (which is based on Kotlin or Java) to iOS requires developers to rewrite the codes in Swift or Objective-C so it can interact with iOS application programming interfaces ("APIs").[51] Taking the code for an iOS app and downloading it to an Android mobile device would result in a non-functional app that cannot run on Android.[52] While there are some development tools that allows developers to build apps on one codebase across operating systems and platforms (*e.g.*, mobile, web, desktop),[53] these tools do not appear to be widely adopted by the developer community, as developers prefer to build native apps for Android and iOS to optimize the unique functionalities of each mobile OS.[54] As a result, developers must spend time and resources to develop a different app for a different OS.[55]

44. App developers must decide for which mobile OS ecosystem(s) they want to develop mobile apps, how to distribute them, and whether and how to receive payment for apps or purchases

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[51] *See*, *e.g.*, Ilyukha, Vitaliy, "How to Port Android Apps to iOS?," *Jelvix*, available at https://jelvix.com/blog/porting-android-apps-to-ios.

[52] For example, apps written for iOS require specific technical elements to support hardware and software features, such as the Apple Touch ID fingerprint scanner and iOS notification widgets that will not function on Android devices. *See* Email from Marcy, to Eric Schmidt, Google, "Subject: Your session will be great!" January 9, 2012, GOOG-PLAY-008156711-712, at 712 ([redacted]). *See also* Dury (GetJar) Deposition, p. 69 ([redacted]); and Costello, Sam, "Can you Run iPhone Apps on Android and Windows?," *Lifewire,* March 20, 2021, available at https://www.lifewire.com/running-iphone-apps-android-and-windows-1999072.

[53] One example of the cross-platform development tool is the Google-owned Flutter. *See* Flutter, "Build Apps for Any Screen," available at https://flutter.dev.

[54] *See* Competition and Markets Authority, "Mobile ecosystems – Market study Final report," June 10, 2022, available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1096277/Mobile_ecosystems_final_report_-_full_draft_-_FINAL__.pdf (hereafter "CMA Final Report on Mobile Ecosystems"), ¶¶ 4.160-4.161.

[55] Brady (Google) Deposition, p. 72 ([redacted]); and Dury (GetJar) Deposition, pp. 163-164; Morrill (Amazon) Deposition, p. 259 ([redacted]). .

made through apps. As detailed below, due to network effects[56], an ecosystem and OS will become more valuable to developers as the number of users increases.

45. Since Android and iOS are the two leading mobile OSs with the largest user base in the U.S. (and globally), app developers have an incentive to develop apps for both platforms.[57] First, as explained in greater detail below in Section V.C.4, [redacted].[58] This is a practice known as "single-homing." Developers therefore likely do not view Android users and iOS users as substitutes; rather, developers recognize these two user bases as separate but complementary populations that together form nearly all of the customer base available to consume apps.[59] Second, some apps—such as social networking, dating, ridesharing, and gaming apps—run "cross-platform," that is, on a system shared by users of both Android and iOS devices.[60] These apps often

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[56] I discuss network effects in Section V.A.2 below.

[57] *See*, *e.g.*, Bresnahan, Timothy, Joe Orsini, and Pai-Ling Yin, "Demand heterogeneity, inframarginal multihoming, and platform market stability: Mobile apps," Working Paper, September 2015, available at https://digital.hbs.edu/wp-content/uploads/2017/12/Demand-Heterogeneity-Inframarginal-Multihoming-and-Platform-Market-Stability-Mobile-Apps.pdf, pp. 24, and 28. Android and iOS are the two leading OSs among all types of smart mobile devices. *See* Statcounter, "Mobile Operating System Market Share United States Of America," available at https://gs.statcounter.com/os-market-share/mobile/united-states-of-america and Statcounter, "Mobile Operating System Market Share Worldwide," available at https://gs.statcounter.com/os-market-share/mobile/worldwide.

[58] Compass Lexecon, "An economic assessment of the effects of Apple's Licence Agreement with Spotify," April 9, 2019, STATEAGS_0023196-250, at 202 [redacted]. *See also* CMA Final Report on Mobile Ecosystems, ¶ 3.39 ("Most users appear to only have smartphones that use one operating system – 80% of users appear to only use one smartphone and evidence suggests that even when users are purchasing an additional smartphone, it is normally one using the same operating system").

[59] As I discussed in my chapter, competing platforms are seen as complementary products by agents on one side with the presence of single-homing agents on the other side. *See* Jullien, Bruno, Alessandro Pavan, and Marc Rysman, "Two-sided Markets, Pricing, and Network Effects," *Handbook of Industrial Organization*, Vol. 4, No. 1, 2021, pp. 485-592 (hereafter "Jullien (2021)"), at p. 43.

[60] Email from Google Alerts, Google, to Eric Chu, former Engineering Director for Google, "Subject: Google Alert - android," October 31, 2016, GOOG-PLAY-001085889-890, at 889 [redacted]. *See also* Lyft, "Phone software recommendations and settings," available at https://help.lyft.com/hc/en-us/all/articles/115013080508-Phone-software-recommendations-and-settings; Matthews, Dylan, "9 questions about the dating app Hinge you were too embarrassed to ask," *Vox*, March 19, 2015, available at https://www.vox.com/2015/3/19/8257357/hinge-explained; and Cash, Adam, "Top 16 iOS Android Cross-Platform Games," *iSkysoft*, May 5, 2022, available at https://www.iskysoft.com/phone-transfer/ios-android-cross-platform-games.html.

become more valuable as more consumers use the app, which further incentivizes developers to develop an app for both platforms. .

46. Moreover, because users of mobile OSs largely single-home (meaning they have a single smart mobile device or prefer to maintain their smart mobile devices on one OS, typically iOS or Android), for developers, choosing one OS over the other would risk losing scale and leaving market share open to competitors willing to design cross-platform apps.[61] Many developers therefore develop apps for both Android and iOS (*i.e.*, the developers "multi-home" by targeting both user groups). According to App Annie, all of the top 100 apps on the Google Play store are also available on the Apple App Store.[62] Further, Google notes that [redacted][63] and that "app developers typically multi-home across different operating systems."[64].

C. Distribution of Mobile Applications

47. App developers can distribute apps to Android smart mobile device users in three main ways: (i) through Android app stores like the Google Play Store; (ii) by reaching an agreement with an OEM or carrier to pre-load the app on an Android smart mobile device before sale to the end-user; or (iii) directly to Android smart mobile device users via a download from the developer's

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[61] Economic theory suggests that the incentives for agents on one side to multi-home are inversely related to the measure of agents who multi-home on the other side of a platform. For instance, in a market of morning and evening newspapers, readers may read only a single newspaper, whereas advertisers who want to reach all newspaper readers would choose to place ads in all of them. Since the majority of smart mobile device users single-home on one mobile OS, developers tend to multi-home across mobile OSs to benefit from greater interactions and the differentiation of both Android and iOS. *See* Jullien (2022) at p. 43 and Rysman, Marc, "The Economics of Two-Sided Markets," *Journal of Economic Perspectives*, Vol. 23, No. 3, 2009, pp. 125-143 (hereafter "Rysman (2009)"), at p. 130. *See also* CMA Final Report on Mobile Ecosystems, ¶¶ 4.162-4.180.

[62] *See* Appendix C.

[63] *See*, *e.g.*, Google, "App Distribution and the GMS Suite," GOOG-PLAY-001497762-785, at 784.

[64] *See* CMA Final Report on Mobile Ecosystems, ¶ 4.148.

own website or a third-party website, colloquially known as "sideloading."[65,66] In addition, [redacted][67]

1. App Stores

48. App stores are online marketplaces that allow users to search for, download, and install a range of apps onto their smart mobile devices.[68] While apps are available to users either for free or for a charge in app stores, developers are usually required to pay a registration fee to publish any apps, free or paid.[69] App stores themselves are apps; specifically, a type of software compatible with the OS on which they are built. The Apple App Store is the proprietary app store on iOS and

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[65] *See*, *e.g.*, Android Developers, "Publish your app," August 10, 2022, available at https://developer.android.com/studio/publish; Lim (Google) Deposition, pp. 273-274 ("Q. [redacted]); and Kleidermacher (Google) Deposition, p. 139 ("Q. [redacted]).

[66] To a much lesser extent, developers can also in theory reach users through peer-to-peer (p2p) sharing by end-users to each other over email, local WiFi, Bluetooth, or hard media storage such as SD Cards and hard drives; such practices are more common in remote areas with limited cellular access. In particular, p2p file transfer apps such as ShareIt are gaining popularity in low bandwidth regions including [redacted]) and Google, Untitled, GOOG-PLAY-000801782-784, at 782 ("[redacted]). *See also* Staltz, André, "Nov 2019 update," *Manyverse Blog*, November 5, 2019, available at https://www manyver.se/blog/2019-11-update (describing sharing of the app to "off grid" users in Mexico and Brazil).

[67] Email from Mike Cleron, Google, to Hiroshi Lockheimer, Senior Vice President of Platforms & Ecosystems for Google, "Subject: Re: [redacted]" December 10, 2014, GOOG-PLAY-004449004-006, at 004 ([redacted]).

[68] *See* Lim (Google) Deposition, p. 80 ([redacted]). *See also* EC Google Android Decision, ¶ 86.

[69] For example, there is a $25 one-time registration fee for a developer to register to use the Google Play Console and thereby publish any number of apps to Google Play. *See* Google, "How to use Play Console," available at https://support.google.com/googleplay/android-developer/answer/6112435. Apple charges a $99 registration fee. *See* Apple, "Apple Developer Program," available at https://developer.apple.com/support/compare-memberships/.

cannot be downloaded to Android smart mobile devices, while the Google Play Store is the dominant app store for Android OS and cannot be downloaded or installed to, or even operate on, iOS smart mobile devices.[70]

49. Besides the Google Play Store, there are several alternative app stores that can serve as app distribution channels on Android smart mobile devices, including the Amazon Appstore, and F-Droid, as well as the Samsung Galaxy Store, which is available only on Samsung devices.[71] However, competing Android app stores have much smaller user bases than the Google Play Store, even when they have relatively high installed bases. For instance, [redacted][72] and, according to Google documents, [redacted][73] As discussed in Section VII, these alternative Android app stores may not be distributed to Android users through the Google Play Store, but instead can be pre-loaded on Android smart mobile devices by an OEM (in the case of the Samsung Galaxy Store on Samsung smart mobile devices) or sideloaded by Android users (in the case of Amazon Appstore, F-Droid, and others).

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[70] Balancing Act, [redacted] July 2011, GOOG-PLAY-005571079-209, at 191 ([redacted]).

[71] Poetker, Bridget, "The Must-Know Mobile App Stores (Native and Third-Party Options)," *G2,* June 13, 2019, available at https://www.g2.com/articles/app-stores. *See* Samsung, "Frequently asked questions about Galaxy Store," available at https://www.samsung.com/us/support/answer/ANS00076970/#:~:text=Galaxy%20Store%20for%20phone%20or%20tablet&text=Galaxy%20Store%20is%20only%20available%20on%20Samsung%20devices ("Galaxy Store is only available on Samsung devices").

[72] Email from Vikram Natarajan, Google, to Guru Nagarajan, Google, [redacted] April 30, 2017, GOOG-PLAY-008681354-355, at 354 ([redacted]) and Takahashi, Dean, "Samsung Galaxy App Store gains ground in the U.S. with each smartphone launch," *Venture Beat,* April 22, 2017, available at https://venturebeat.com/mobile/samsung-galaxy-app-store-gains-ground-in-the-u-s-with-each-smartphone-launch/.

[73] Google, [redacted] March 2019, GOOG-PLAY-001265881.R-922.R, at 883.R.

2. Sideloading

50. In addition to downloading apps from the Google Play Store or alternative Android app stores, users can also sideload apps onto their Android smart mobile devices.[74] "Sideloading" refers to the direct downloading and installation of Android installation packages ("APKs") directly from websites, which allows users to bypass app store apps.[75] For instance, some popular gaming apps (*e.g.*, Fortnite) are available to Android users only through sideloading or an app store besides the Google Play Store.[76]

51. According to Google documents, sideloading is only possible on Android smart mobile devices if users change device settings to permit installations from "Unknown Sources" and click through system-generated warning messages that pop up throughout the sideloading process.[77] For example, in 2015, consumers who attempted to install the [redacted]—a competing app store—received a series of warning messages as shown in Exhibit 7 below.

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[74] An equivalent form of app distribution off the App Store on iOS is called "jailbreak." *See*, *e.g.*, Nield, David, "How to Install Apps From Outside Your Phone's App Store," *WIRED*, August 9, 2020, available at https://www.wired.com/story/install-apps-outside-app-store-sideload/.

[75] [redacted] *See* Google, [redacted] October 7, 2016, GOOG-PLAY-000042623.R-639.R, at 625.R.

[76] Epic Games, "Play Fortnite on Android," available at https://www.epicgames.com/fortnite/en-US/mobile/android/. *See also* F-Droid, "Packages," available at https://www.f-droid.org/en/packages/.

[77] Google, [redacted] November 2015, GOOG-PLAY-000575018.R-038.R, at 021.R ([redacted]); Google, [redacted] March 17, 2016, GOOG-PLAY-004494298.R-325.R, at 318.R-321.R; Samat (Google) Deposition, pp. 178-185; and Hoff, John, "How To: Sideloading Apps on Your Android Device," *Android Community,* April 17, 2018, available at https://androidcommunity.com/how-to-sideloading-apps-on-your-android-device-20180417/.

Exhibit 7

[redacted]

52. Google documents indicate that sideloading is limited. For example, Google data indicates that [redacted][78]

D. In-App Billing Services

53. After downloading applications, many apps provide consumers the option of purchasing extra digital content within the app, *e.g.,* to upgrade the user experience or unlock additional features.[79] For the remainder of this report, I use "in-app purchase" to mean purchasing digital content from within the app where the content is used and without the user exiting the "mobile app environment."[80] The revenue generated from in-app purchases far surpasses the revenue from purchases of paid app downloads. For example, [redacted]

[78] Google, [redacted] April 26, 2021, GOOG-PLAY-001508603 (data as of December 1, 2020). These data reflect [redacted] *See* Cunningham (Google) Deposition, pp. 442-443 ("[redacted]). *See also* Cunningham (Google) Deposition, p. 438 ("[redacted]" *See also* Letter from Benjamin G. Bradshaw, O'Melveny, to John D. Byars, Bartlit Beck, April 29, 2022.

[79] *See* Google, "Make in-app purchases in Android apps," available at https://support.google.com/googleplay/answer/1061913?hl=en. In-app payments occur in both free and paid apps (on top of the initial payment to download the app). *See* Adjust, "What is an in-app purchase?" available at https://www.adjust.com/glossary/in-app-purchase/.

[80] Cramer (Google) Deposition, p. 426 ("[redacted]").

[redacted][81] In 2020, worldwide consumer spending on in-app purchases, subscriptions, and paid apps in the Google Play Store reached [redacted][82] Gross consumer spending in app stores across all platforms reached $170 billion in 2021, with more than 230 apps and games surpassing $100M in annual consumer spending and 13 of them surpassing $1 billion.[83]

54. To complete in-app purchases, mobile apps use in-app billing services to verify a consumer's payment card information and release the digital content to the end-user upon payment confirmation.[84] Providers of in-app billing services may (or may not) also offer additional functions, such as invoicing, payment history, and refund processing.[85] In-app billing services are software solutions (coded in software development kits ("SDKs") or APIs) that enable users to purchase

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[81] *See* Rysman Workpapers.

[82] Chan, Stephanie, "Global Consumer Spending in Mobile Apps Reached a Record $111 Billion in 2020, Up 30% from 2019," *Sensor Tower*, January 2021, available at https://sensortower.com/blog/app-revenue-and-downloads-2020. Assuming the amount of spending by purchase type for worldwide consumer spending is the same as app revenue breakdown for the U.S., worldwide consumer spending for in-app purchases, subscriptions, and paid apps were [redacted] *See* Rysman Workpapers.

[83] Data.ai, "State of Mobile 2022," available at https://www.data.ai/en/go/state-of-mobile-2022 (Note that global consumer spending includes those on iOS, Google Play, and third-party Android stores in China).

[84] Dubrova, Daria, "How to integrate payment systems into the existing app," *The App Solutions*, available at https://theappsolutions.com/blog/development/payment-systems-for-the-app/.

[85] For example, Amazon's In-App Purchasing API performs the following workflow: "logic to display the purchasable item,"; "perform the purchase,"; "handle any preconditions or error scenarios." It does not offer refunds on purchases of in-app items or track consumers' purchases. *See* Amazon Appstore, "In-App Purchasing Overview," February 25, 2022, available at https://developer.amazon.com/docs/in-app-purchasing/iap-overview html. *See also* First Amended Complaint, ¶ 169.

digital content within an app.[86,87] In-app billing services generally include receiving payment and authorizing the unlocking of the purchased in-app content.[88] A payment gateway works as a virtual terminal at checkout to encrypt credit card information / payment credentials from the customer and pass them to payment processors, which then pass a consumer's payment data to an issuing bank, collect funds from the card-issuing bank, and transfer the funds to the merchant's account after deducting a fee.[89] [redacted][90]

55. Depending on the type of in-app purchase, developers can use third-party independent billing service providers, develop their own billing service within their apps, or use Google Play Billing or other app store billing services to complete in-app purchases on Android

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[86] For example, "Samsung In-App Purchase (IAP) is a payment service that makes it possible to sell a variety of items in applications for Samsung Galaxy Store and internally manages communication with supporting IAP services in the Samsung ecosystem, such as Samsung Account, Samsung Checkout, and Samsung Rewards. In-App Purchase can be used either to make a one-off payment or to pay for a regular subscription. Items that can be sold through In-App Purchase include premium content, virtual goods such as in-game items, and specific services with different length license terms." Samsung IAP also offers SDK and server APIs that allow the developer to "easily integrate IAP functionality into your app, such as configuring IAP, getting item details, offering and selling items, and managing purchased items" and "communicate with IAP server to verify item purchases, create a service token, and check subscription status." *See* Samsung, "What is Samsung In-App Purchase?" available at https://developer.samsung.com/iap/overview.html.

[87] For example, Amazon explains their In-App API functionality as follows: "The In-App Purchasing (IAP) API allows your app to present, process, and fulfill purchases of digital content and subscriptions within your app … With In-App Purchasing (IAP), your app's users can purchase various types of digital items within your app, such as extra lives for a game or a subscription to premium content." *See* Amazon Appstore, "In-App Purchasing Overview," May 18, 2022, available at https://developer.amazon.com/docs/in-app-purchasing/iap-overview html.

[88] Xsolla, for example, is an online payment gateway that connects to credit cards networks (*e.g.*, Visa), integrated billing service providers (*e.g.*, PayPal), and payment systems (*e.g.*, Apple Pay and Google Pay). *See* Xsolla, "Pay Station," available at https://xsolla.com/products/paystation and Xsolla, "Grant Purchases to User," August 22, 2022, available at https://developers.xsolla.com/solutions/web-shop/catalog-and-items/grant-purchases/. As another example, Zuora is a payment processor specializing in subscription billing services. *See* Zuora, "Billing Software," available at https://www.zuora.com/products/billing-software/.

[89] *See*, *e.g.*, Dublino, Jennier, "Payment Gateway vs. Payment Processor," *business.com,* September 20, 2022, available at https://www.business.com/articles/payment-gateway-vs-payment-processor/.

[90] Chu (Meta Platforms (formerly Google)) Deposition, p. 259 ("[redacted].

smart mobile devices.[91] Google has different rules for purchases of physical goods (*e.g.*, housewares, clothing, electronics) and services (*e.g.*, food delivery, transportation services, event tickets) than it has for 'digital' content; while Google requires use of Google Play Billing for in-app purchases, Google forbids using Google Play Billing for the purchase of physical goods or services, credit card and utility payments, peer-to-peer payments, or gambling.[92] Digital content includes subscription services, access to ad-free or premium content, game currencies or equipment, and cloud storage services.[93] Unlike for digital content, there are many major third-party providers of billing services for physical goods and services purchased on Android smart mobile devices, including, for example, PayPal, Adyen, Braintree, and Stripe.[94,95] In contrast to Google's historical 30% rate to developers, these billing service providers charge a rate at or below 2.99% plus 49 cents per transaction, as shown in Exhibit 8.[96]

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[91] See, e.g., Perez, Sarah, "Google Play to pilot third-party billing option, starting with Spotify," TechCrunch, March 23, 2022, available at https://techcrunch.com/2022/03/23/google-play-to-pilot-third-party-billing-option-globally-starting-with-spotify/; Google, "Payments," available at https://support.google.com/googleplay/android-developer/answer/9858738?hl=en; and Stripe, "Stripe Android SDK," Github, available at https://github.com/stripe/stripe-android.

[92] *See* Google, "Payments," available at https://support.google.com/googleplay/android-developer/answer/9858738?hl=en.

[93] *See* Google, "Payments," available at https://support.google.com/googleplay/android-developer/answer/9858738?hl=en. *See*, *e.g.*, Google, "Make in-app purchases in Android apps," available at https://support.google.com/googleplay/answer/1061913. *See also* Apple, "Buy additional app features with in-app purchases and subscriptions," December 17, 2021, available at https://support.apple.com/en-us/HT202023.

[94] *See*, *e.g.*, PayPal Editorial Team, "Payments Processing 101: Learn how your money gets to you," *Paypal*, September 10, 2019, available at https://www.paypal.com/uk/brc/article/how-online-payments-processing-works.

[95] Additionally, developers may have coded/integrated payment processors or payment gateways such as Xsolla or Nets directly into the app. *See* Xsolla, "Find Ways to Grow with Xsolla Business Engine," available at https://xsolla.com/solutions. *See* Nets, "Nets is part of Nexi Group – the European PayTech," available at https://www.nets.eu/who-we-are. *See*, for example, a list of notable online billing service providers: Craig, William, "9+ Excellent Online Payment Systems," *Webfx,* March 2, 2022, available at https://www.webfx.com/blog/web-design/online-payment-systems/.

[96] *See also* Dubrova, Daria, "How to integrate payment systems into the existing app," *The App Solutions*, available at https://theappsolutions.com/blog/development/payment-systems-for-the-app/.

Exhibit 8
Select Alternative Billing Service Providers and Payment Methods[97]

Transaction Service Provider	Transaction Commission	Example Marketplaces
Adyen	2.00% + $0.12 per transaction	Uber, Ebay, and Booking.com
Braintree	2.59% + $0.49 per transaction	StubHub, Airbnb, and GrubHub
PayPal	2.99% + $0.49 per transaction	Etsy
Stripe	2.90% + $0.30 per transaction	Lyft, Postmates, and Kickstarter

Notes:

1. Commissions reflect U.S. card transactions. The fees can fluctuate depending on the payment method and region.
2. Braintree is a subsidiary of PayPal.
3. Adyen transaction fee reflects Mastercard and Visa networks.
4. Information current as of September 29, 2022.

56. As described in Section IV.A.5 below, Google inserts its own billing services into the purchase flows of digital in-app content for apps downloaded through the Google Play Store and mandates the processing of payments through Google Play Billing before an item is delivered.[98]

57. Developers, in theory, can also build their own billing services within their apps (rather than using a third-party solution). For example, Spotify and Google recently announced the User Choice Billing program that will allow users to choose whether to use Spotify's own billing system and Google Play Billing, presented with those options side-by-side.[99] While Spotify's payments for purchases transacted through the Google Play Store are processed through Google Play Billing, to handle their complex payment subscriptions, Spotify's software engineers use a

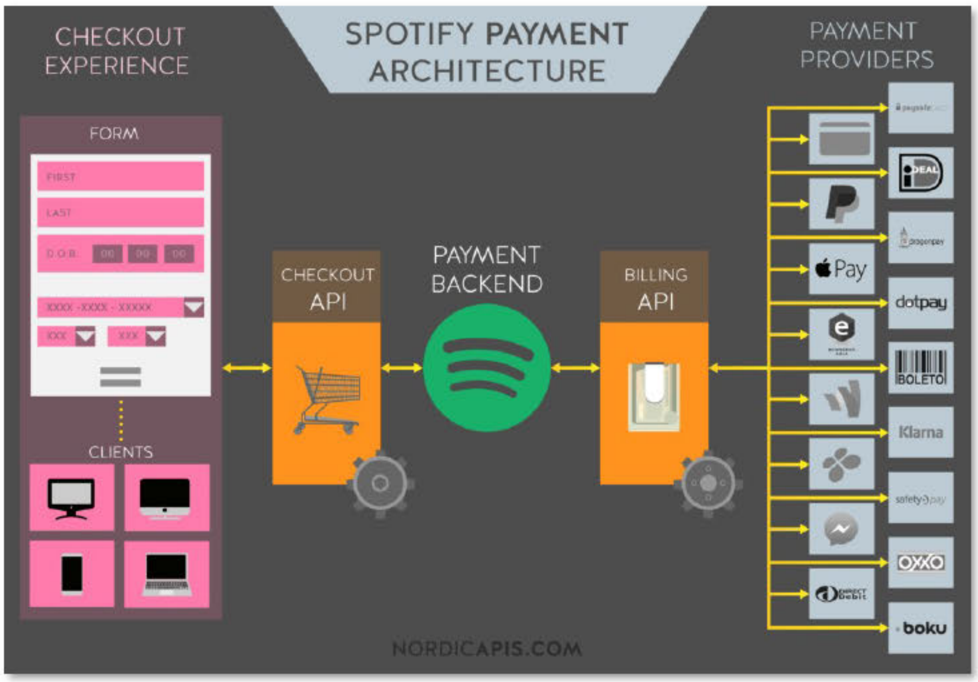
[97] Adyen, "Pricing," available at https://www.adyen.com/pricing; Braintree, "Pricing," available at https://www.braintreepayments.com/braintree-pricing; PayPal, "PayPal Merchant Fees," September 19, 2022, available at https://www.paypal.com/us/webapps/mpp/merchant-fees; Stripe, "Pricing built for businesses of all sizes," available at https://stripe.com/pricing#pricing-details; Adyen, "Our customers," https://www.adyen.com/customers; Braintree, "Braintree Merchants," available at https://www.braintreepayments.com/learn/braintree-merchants; Etsy, "Etsy Payments Policy," June 6, 2022, available at https://www.etsy.com/legal/etsy-payments/; and Stripe, "Customers," available at https://stripe.com/customers.

[98] Google, "Purchase flow," July 15, 2021, available at https://developers.google.com/standard-payments/concepts/tokenized_fop/purchase-flow.

[99] Samat, Sameer, "Exploring User Choice Billing With First Innovation Partner Spotify," *Android Developers Blog*, March 23, 2022, available at https://android-developers.googleblog.com/2022/03/user-choice-billing html. *See also* Perez, Sarah, "Google Play to pilot third-party billing option, starting with Spotify," *TechCrunch,* March 23, 2022, available at https://techcrunch.com/2022/03/23/google-play-to-pilot-third-party-billing-option-globally-starting-with-spotify/.

private API for its own billing system: "[the] Checkout API to help build flows that make it easy for users to enter payment details, and the Billing API to interface with the various details of Payment Providers and Credit Networks, enabling the Payment Backend to determine if they can charge a user for a subscription with a single call."[100] Spotify's bespoke solution is depicted in Exhibit 9 below.

Exhibit 9
Spotify Payment Architecture



Source: Doerrfeld, Bill, "The Brilliance of Spotify Internal APIs to Mitigate Payments," Nordic APIs, November 8, 2016, available at https://nordicapis.com/the-brilliance-of-spotify-internal-apis-to-mitigate-payments/.

58. However, in most instances, as described in Section VIII below, Google's rules prevent developers from leading users to their proprietary billing services within their apps. Thus, even if developers want to develop their own billing services, they are unable to inform Android

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[100] *See* Doerrfeld, Bill, "The Brilliance of Spotify Internal APIs to Mitigate Payments," *Nordic APIs*, November 8, 2016, available at https://nordicapis.com/the-brilliance-of-spotify-internal-apis-to-mitigate-payments/.

users who downloaded their app through the Google Play Store that this alternative billing solution is available.

IV. Google Agreements and the Challenged Conduct

A. Google Background

1. Development of the Android Mobile OS

59. Android, Inc. was developed in October 2004 [redacted][101] [redacted][102] [redacted][103] [redacted][104]

60. [redacted][105] [redacted][106] [redacted]

[101] Rubin (formerly Google) Deposition, pp. 24-25 ([redacted]. *See also* Elgin, Ben, "Google Buys Android for Its Mobile Arsenal," *Business Week*, August 17, 2005, available at https://www.tech-insider.org/mobile/research/2005/0817.html.

[102] Sears (Google) Deposition, pp. 24-25 ([redacted]).

[103] Sears (Google) Deposition, p. 25.

[104] Rubin (formerly Google) Deposition, p. 24.

[105] Rubin (formerly Google) Deposition, p. 24.

[106] Rubin (formerly Google) Deposition, pp. 26 -27 ([redacted]).

[redacted][107] [redacted][108] [redacted][109] [redacted][110] [redacted][111]

61. [redacted]

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[107] Sears (Google) Deposition, p. 28; Sears (Google) Deposition, pp. 184-185 ([redacted]).

[108] Rubin (formerly Google) Deposition, p. 26 ([redacted]); Google, "Key Themes," GOOG-PLAY-001135055-086, at 057 ([redacted]); Sears (Google) Deposition, p. 184 ([redacted]).

[109] Sears (Google) Deposition, p. 186 ([redacted].

[110] Sears (Google) Deposition, p. 186 [redacted]; and Roth, Daniel, "Google's Open Source Android OS Will Free the Wireless Web," *Wired*, June 23, 2008, available at https://www.wired.com/2008/06/ff-android/, ("Rubin said his startup, called Android, had the solution: a free, open source mobile platform [. . .] He would make his money by selling support for the system—security services, say, or email management.").

[111] Rubin (formerly Google) Deposition, pp. 48-49 ([redacted].

[redacted][112] [redacted][113] [redacted][114] [redacted][115] [redacted][116]

62. Android debuted on its first commercial mobile device, the HTC Dream, in September 2008 on the T-Mobile network, where it was alternatively branded the G1.[117] As explained in greater detail below in Section IV.B.5, Google and T-Mobile entered into a series of agreements accompanying the launch of the G1.

2. Android Mobile OS at Release

63. Google announced Android to the public in 2008.[118] The Android mobile OS was built on the Linux kernel, part of an existing OS.[119] Android originally included a suite of free and

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[112] Sears (Google) Deposition, pp. 32-33.

[113] Roth (2008) [redacted].

[114] Sears (Google) Deposition, p. 33 ([redacted]).

[115] Roth, Daniel, "Google's Open Source Android OS Will Free the Wireless Web," Wired, June 23, 2008.

[116] Rubin (formerly Google) Deposition, p. 28 ([redacted]); Google, "Key Themes," GOOG-PLAY-001135055-086, at 057 ([redacted]); Google, "Google's Next Revolution," GOOG-PLAY-001422296-304 at 301 ([redacted]); Manjoo, Farhad "A Murky Road Ahead for Android, Despite Market Dominance," *N.Y. Times*, May 27, 2015, available at https://www nytimes.com/2015/05/28/technology/personaltech/a-murky-road-ahead-for-android-despite-market-dominance html ("Android reportedly cost at least $50 million").

[117] Rubin (formerly Google) Deposition, p. 57 ([redacted]); Cragg, Oliver, "Remembering the first Android phone, the T-Mobile G1 (HTC Dream)," *Android Authority*, September 24, 2021, available at https://www.androidauthority.com/first-android-phone-t-mobile-g1-htc-dream-906362 ("But that relationship started with the first Android phone, launched on September 23, 2008, the HTC Dream. Just under a month later, the same phone went on sale in the US on October 22 for a price of $179 called the T-Mobile G1.").

[118] *See* Open Handset Alliance, "Google and the Open Handset Alliance Announce Android Open Source Availability," October 21, 2008, available at http://www.openhandsetalliance.com/press_102108 html.

[119] Google, "Android Anatomy and Physiology," GOOG-PLAY-010100574-693, at 578 ([redacted] (emphasis in original)); Callaham, John, "The history of Android: The evolution of the biggest mobile OS in the world," *Android Authority*, August 13, 2022, available at https://www.androidauthority.com/history-android-os-name-789433/.

open-source apps, including an instant messaging app, browser, camera, calculator, contact list, calendar, email app, clock, and a media player.[120] In contrast to Apple's iOS, open-source Android is not, upon release, proprietary to Google. The Android source code is available for use for free under the terms of the Apache License (discussed in Section IV.B.1 below), and anyone may download it from Google's website.[121] [redacted].[122] [redacted][123]

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[120] Google, [redacted] GOOG-PLAY-010100574-693, at 576; Google, "2008 Google I/O Session Videos and Slides: Anatomy & Physiology of an Android." available at https://sites.google.com/site/io/anatomy--physiology-of-an-android; and Brady (Google) Deposition, p. 321 [redacted]

[121] *See* Android, "Android Open Source Project," available at https://source.android.com; Brady (Google) Deposition, pp. 42-43 [redacted]; Google, "Android Strategy and Partnerships Overview," June, 2009, GOOG-PLAY-008389054-089, at 062 [redacted]); Rosenberg (Google) Deposition, p. 187 ([redacted]; Google, [redacted] GOOG-PLAY-009295801-815, at 814 [redacted].

[122] *See* Google, [redacted] February 2, 2018, GOOG-PLAY-001559464.R-496.R, at 468.R [redacted]"). *See also* DeviceAtlas, "Android forks: Why Google can rest easy, for now," available at https://deviceatlas.com/blog/android-forks-why-google-can-rest-easy-for-now ("There are two kinds of Android forks – 'compatible' and 'non-compatible'.").

[123] Email from Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, to Daniel Conrad, [redacted] June 12, 2009, GOOG-PLAY-008389051, and attachment [redacted] June 2009, GOOG-PLAY-008389054-089, at 062 [redacted] and 063.

3. Google Mobile Services

64. I understand that [redacted][124] In addition to the Android OS, Google offers Google Mobile Services ("GMS"), which is composed of a suite of proprietary "Google applications and APIs that help support functionality across devices" (such as Gmail, YouTube, and Google Maps), available only to OEMs that execute separate license agreements with Google.[125] [redacted][126] [redacted][127] GMS "is available [to OEMs] only through a license with Google," which requires pre-installation of the Google Play Store in a preferential location on the device home screen.[128] Unlike the

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[124] Rosenberg (Google) Deposition, pp. 189-190 [redacted].

[125] *See, e.g.*, Android, "Google Mobile Services," available at https://www.android.com/gms/; and Rosenberg (Google) Deposition, pp. 189-190 [redacted] and pp. 192-193 [redacted] Kolotouros (Google) Deposition, pp. 60-61 [redacted] and p. 62 [redacted]

[126] Android Global Business Team, "Android 101," May 2019, GOOG-PLAY-000128863.R-908.R at 876.R ([redacted] and Kolotouros (Google) Deposition, p. 448 [redacted]

[127] Brady (Google) Deposition, p. 45 [redacted] Email from Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, to Wirelessbiz, [redacted] October 13, 2008, GOOG-PLAY-008471716-720, at 717 [redacted]

[128] Android, "Android Compatibility Program Overview," available at https://source.android.com/docs/compatibility/overview. *See* Exhibit 61.

Android OS, GMS is not open source, but is integrated at the system level, which enables developers to incorporate Google services such as Google Pay into their apps.[129,130] [redacted].[131]

65. As explained in greater detail in Section IV.B.4 below, [redacted][132] [redacted]

[129] Wankhede, Calvin, "What are Google Mobile Services (GMS)?," *Android Authority*, March 3, 2022, available at https://www.androidauthority.com/google-mobile-services-gms-3025963/.

[130] As discussed in paragraph 76, Google Pay is different from in-app billing services like Google Play Billing but is instead a payment system that allows consumers to store their credit card information in the "digital wallet" on their mobile device and make purchases or send money with their smartphones.

[131] [redacted] *See* Google, "Mobile Application Distribution Agreement (Android)," June 17, 2014, GOOG-PLAY-000449883-897, at 885. *See also* Brady (Google) Deposition, p. 44 [redacted] P. 98 [redacted] and pp. 190-191 [redacted]; and Rosenberg (Google) Deposition, pp. 192-193 [redacted]

[132] Google, [redacted] GOOG-PLAY-009295801-815, at 810 [redacted] Brady (Google) Deposition, pp. 201-202 [redacted]; Li (Google) Deposition, p. 194 [redacted]; Email from Yeum Doug, Google, to Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, [redacted] April 27, 2010, GOOG-PLAY4-000341393-394 at 393 [redacted]

[redacted][133] that Google sunset or stopped updating, as explained below in Section VII.A.

4. *The Google Play Store*

66. The Google Play Store is, according to Google, "a platform that app developers can use to distribute apps, and consumers can use to discover and install apps, on devices running the Android OS."[134] Google Play sells not only apps, but also other digital content like movies, TV shows, and books.[135]

67. The predecessor to the Play Store was "Android Market," which Google launched in October of 2008 with the early Android smart mobile devices, such as the T-Mobile G1.[136] [redacted]

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[133] [redacted] *See* Brady (Google) Deposition, p. 292 ("[redacted].

[134] "Google's Responses and Objections to Epic's Second Set of Interrogatories," *Epic Games Inc. v Google LLC et al.*, United States District Court Northern District of California San Francisco Division, Case No. 3:20-cv-05671-JD and Case No. 3:21-md-02981-JD, August 19, 2021.

[135] "Google's Responses and Objections to Epic's Second Set of Interrogatories," *Epic Games Inc. v Google LLC et al.*, United States District Court Northern District of California San Francisco Division, Case No. 3:20-cv-05671-JD and Case No. 3:21-md-02981-JD, August 19, 2021 (explaining that Google Play is "a platform that app developers can use to distribute apps, and consumers can use to discover and install apps, on devices running the Android OS."); and Google Play, "How Google Play works," available at https://play.google.com/about/howplayworks/ (explaining that "people go to find their favorite apps, games, movies, TV shows, books, and more.").

[136] Rubin (formerly Google) Deposition, p. 58 [redacted]; Brady (Google) Deposition p. 35 [redacted] EC Google Android Decision, ¶ 123; German, Kent, "A brief history of Android phones," *CNET*, August 2, 2011, available at http://www.cnet.com/news/a-brief-history-of-android-phones/.

[redacted]"[137] [redacted][138] Google explained that its use of the word "market" instead of "store" was intentional to highlight its openness to developers for distributing their content to consumers: "We chose the term 'market' rather than 'store' because we feel that developers should have an open and unobstructed environment to make their content available."[139]

68. [redacted][140] Google also sold Android smart mobile devices through

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[137] Brady (Google) Deposition, pp. 150-151 [redacted]; Google, "Android Strategy and Partnerships Overview," June 2009, GOOG-PLAY-008389054-089, at 085 ([redacted]

[138] Email from Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, to Mark Vandenbrink, Vice President of Technology Solutions at Samsung Telecommunications America, "Subject: RE: Yet Another Question," November 5, 2009, GOOG-PLAY-001501104-106, at 105 [redacted]; Brady (Google) Deposition, pp. 456-457 ([redacted]

[139] Android Developers, "Android Market: a user-driven content distribution system," August 28, 2008, available at https://android-developers.googleblog.com/2008/08/android-market-user-driven-content html.

[140] Rubin (formerly Google) Deposition, p. 430 [redacted]); Brady (Google) Deposition, p. 35 ([redacted]); and Email from Justin Mattson, Google, to Dan Morill, Google, and Eric Chu, Google, "Subject: [redacted]" December 17, 2009, GOOG-PLAY-004338990-993, at 990 ([redacted].

Android Market.[141] [redacted]"[142]

69. In 2011, Google started discussing rebranding Android Market under a code name called [redacted][143] Patrick Brady, then-Director of Android Partner Engineering, [redacted][144] [redacted][145] [redacted][146]

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[141] Google, [redacted] GOOG-PLAY-003773053.R-065.R [redacted] Gold (Google) Deposition, pp. 34-35; Email from Cristina Bita, Google, to Sundar Pichai, Google, June 2, 2013, GOOG-PLAY4-000038856-858, at 857; Gold (Google) Deposition, p. 161 [redacted]

[142] Google, "Android Strategy and Partnerships Overview," June 2009, GOOG-PLAY-008389054-089, at 085.

[143] Brady (Google) Deposition, p. 266 [redacted] and pp. 269-271.

[144] Email from Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, to Eric Chu, Engineering Director at Meta Platforms and formerly Director of the Android Developer Ecosystem at Google, [redacted] March 24, 2011, GOOG-PLAY-005668770-771, at 770.

[145] Email from Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, to Eric Chu, Engineering Director at Meta Platforms and formerly Director of the Android Developer Ecosystem at Google, [redacted] March 24, 2011, GOOG-PLAY-005668770-771, at 770; Brady (Google) Deposition, pp. 269-270 [redacted]; Brady (Google) Deposition, pp. 270-271.

[146] Email from Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google for Google, to Hugo Barra, Google, Shari Doherty, Google, Eric Chu, Engineering Director at Meta Platforms and formerly Director of the Android Developer Ecosystem at Google, Marc Vanlerberghe, Google, Michael Siliski, Google, Hiroshi Lockheimer, Senior Vice President of Platforms & Ecosystems at Google, John Lagerling, Vice President of Business Development Mobile and Product Partnerships at Meta (formerly Facebook) and formerly Senior Director of Android Global Partnerships at Google, Jamie Rosenberg, Vice President of Strategy and Operations, Platforms and Ecosystems Division, at Google, Matias Duarte, Google, [redacted]" April 26, 2011, GOOG-PLAY-006339980-982, at 980; Brady (Google) Deposition, pp. 290-291.

70. Ultimately, Google "consolidated all of the operating system's content stores into […] the Google Play Store," which launched and replaced Android Market in March 2012.[147] With the launch of the Google Play Store, Google rebranded Google Music, Google Books, and Google Movies to Google Play Music, Google Play Books, and Google Play Movies, respectively, and made them available within the Google Play Store.[148]

71. By 2014, the Google Play Store became the "largest Google business outside of its advertising efforts."[149] In 2015, the Google Play Store stopped selling hardware devices and focused on the download and purchase of digital content.[150]

72. More than 3.5 million apps were available on the Google Play Store as of the second quarter of 2022, making it the largest app store across all mobile operating systems in the world (excluding China where the Google Play Store is not permitted to operate due to Chinese government's restrictions on Google's commercial activities after 2010[151]).[152] The Google Play Store gained more than 1 billion monthly active users as early as 2015[153] and generated 111.3 billion app downloads in 2021.[154]

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[147] Callaham, John, "From Android Market to Google Play: a brief history of the Play Store," *Android Authority*, March 6, 2017, available at https://www.androidauthority.com/android-market-google-play-history-754989/ (hereafter "Callaham (2017)"). *See* Chu (Meta Platforms (formerly Google)) Deposition, p. 29 [redacted]").

[148] Rutnik, Mitja, "What was Android Market and how is Google Play different?," *Android Authority*, December 4, 2017, available at https://www.androidauthority.com/android-market-google-play-different-787082/.

[149] Grush, Andrew, "Google Play is now Google's biggest cash maker after advertising," *Android Authority*, June 25, 2014, available at https://www.androidauthority.com/google-play-biggest-cash-maker-397156/.

[150] Callaham, John, "From Android Market to Google Play: a brief history of the Play Store," *Android Authority*, March 6, 2017.

[151] *See* D'onfro, Jilian "Google is missing out on billions of dollars by not having an app store in China, new data shows," *CNBC,* January 17, 2018, available at https://www.cnbc.com/2018/01/17/google-misses-out-on-billions-in-china html.

[152] *See*, *e.g.*, Statista, "Number of apps available in leading app stores as of 2nd quarter 2022," August 11, 2022, available at https://www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/.

[153] *See*, *e.g.*, Weber, Harrison, "Android passes 1.4B active devices as Google Play passes 1B active users," *Venture Beat,* September 29, 2015, available at https://venturebeat.com/2015/09/29/android-passes-1-4b-active-devices-google-play-passes-1b-active-users/; and Dogtiev, Artyom, "App Stores List," *Business of Apps*, May 4, 2022, available at https://www.businessofapps.com/guide/app-stores-list/.

[154] *See*, *e.g.*, Statista, "Annual number of app downloads from the Google Play Store worldwide from 2016 to 2021," January 3, 2022, available at https://www.statista.com/statistics/734332/google-play-app-installs-per-year/.

5. Google Play Billing

73. When Android Market launched in October of 2008, [redacted][155] Google added the feature in late March 2011 as "In-app Billing."[156] Google Play Billing is Google's billing service that facilitates processing payments (and other services) for single, non-recurring purchases of digital content and recurring subscriptions in the Google Play Store.[157] According to Google, Google Play Billing [redacted][158] Besides processing payments and authorizing purchases, Google Play Billing "tracks products and transactions using purchase tokens and Order IDs" on Google Play Store and provides "post-purchase experiences," such as reminders about free trials ending, refunds, and subscriptions management.[159] Google describes a purchase token as "a string that represents a buyer's entitlement to a product on Google Play. A purchase token indicates that a Google user is entitled to a specific product that is represented by a purchase

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[155] Brady (Google) Deposition, p. 467 [redacted] and Chu (Meta Platforms (formerly Google)) Deposition, p. 108 [redacted]

[156] Chu, Eric, "In-app Billing Launched on Android Market," *Android Developers Blog*, March 29, 2011, available at https://android-developers.googleblog.com/2011/03/in-app-billing-launched-on-android html#:~:text=Today%2C%20we%27re%20pleased%20to,purchases%20from%20within%20your%20apps.

[157] Android, "Google Play's billing system overview," June 29, 2022, available at https://developer.android.com/google/play/billing.

[158] *See*, *e.g.*, Android Developers, "Google Play Billing," available at https://developer.android.com/distribute/play-billing; Loew (Google) Deposition pp. 116-117 [redacted]; Brady (Google) Deposition pp. 224-25 [redacted]

[159] *See* Android Developers, "Google Play's billing system overview," available at https://developer.android.com/google/play/billing. *See also* Kochikar, Purnima, "Google Play's billing system: Update," *Google India Blog,* October 5, 2020, available at https://blog.google/intl/en-in/products/platforms/google-plays-billing-system-update/.

object."[160] An Order ID is "a string that represents a financial transaction on Google Play. This string is included in a receipt that is emailed to the buyer."[161] Google tells developers that they "can use the Order ID to manage refunds in the Google Play Console."[162]

74. To publish apps on the Google Play Store, developers need to set up a Google Play developer account to access the Google Play Console, a platform for developers to publish and manage their apps on the Google Play Store.[163] After apps have been developed (but before being published on the Play Store), developers must integrate the Google Play Billing Library API, an interface that launches purchase requests and handles transactions, into their apps to enable the sales of in-app digital content.[164] However, some parts of Google's in-app billing services, such as verifying purchases and issuing refunds, are not available in the Google Play Billing Library API.[165] Thus, developers need to also integrate the Google Play Developer API on the Play Console to

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[160] *See* Android Developers, "Google Play's billing system overview," June 29, 2022, available at https://developer.android.com/google/play/billing; Loew (Google) Deposition pp. 53-54 ([redacted].

[161] *See* Android Developers, "Google Play's billing system overview," June 29, 2022, available at https://developer.android.com/google/play/billing; Loew (Google) Deposition p. 57 [redacted].

[162] *See* Android Developers, "Integrate the Google Play Billing Library into your app," June 29, 2022, available at https://developer.android.com/google/play/billing/integrate.

[163] *See* Android Developers, "Getting ready," August 17, 2022, available at https://developer.android.com/google/play/billing/getting-ready. *See also* Google Play Console, available at https://play.google.com/console/about/.

[164] *See* Loew (Google) Deposition p. 49 [redacted] Android Developers, "Getting ready," August 17, 2022, available at https://developer.android.com/google/play/billing/getting-ready. *See also* Android Developers, "Integrate the Google Play Billing Library into your app," June 29, 2022, available at https://developer.android.com/google/play/billing/integrate.

[165] *See* Android Developers, "Getting ready," August 17, 2022, available at https://developer.android.com/google/play/billing/getting-ready ("The Google Play Developer API is a server-to-server API that complements the Google Play Billing Library on Android. This API provides functionality not available in the Google Play Billing Library, such as securely verifying purchases and issuing refunds to your users.").

complete the integration of Google Play Billing.[166] I understand, from reviewing the Google Payments Policy and the deposition of Lawrence Koh, [redacted][168]

75. Until 2018, Google charged an average commission of 30% on developers of all purchase types in the Google Play Store, for which Google required the use of Google Play Billing (as shown in Exhibit 36).[169] In recent years, Google has implemented some limited changes to its commission structure. Exhibit 10 below summarizes Google's most recent commission structure as of January 1, 2022. For example, Google implemented a separate policy for developers whose users are in South Korea, due to a regulatory change requiring that developers be permitted to use alternative in-app billing systems instead of Google Play Billing. For these developers, "the service fee for such transactions using the Additional Billing System is equal to the service fee applicable

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[166] *See*, *e.g.*, Android Developers, "Google Play Billing," available at https://developer.android.com/distribute/play-billing. *See also* Android Developers, "Getting ready," August 17, 2022, available at https://developer.android.com/google/play/billing/getting-ready ("The Google Play Developer API is a server-to-server API that complements the Google Play Billing Library on Android. This API provides functionality not available in the Google Play Billing Library, such as securely verifying purchases and issuing refunds to your users."); and Samat (Google) Deposition, pp. 470-471 [redacted]

[167] *See*, *e.g.*, Google Play Help, "Learn about refunds on Google Play," available at https://support.google.com/googleplay/answer/2479637?hl=en-GB#:~:text=Your%20Play%20Pass%20subscription%20can,month%20in%20which%20you%20cancelled ("It's less been than 48 hours since you bought an app or made an in-app purchase: you can request a refund through Google Play."); and Play Console Help, "Understanding Google Play's payments policy," available at https://support.google.com/googleplay/android-developer/answer/10281818. *See also* Koh (EA (formerly Google)) Deposition, p. 383 [redacted]

[168] *See* Koh (EA (formerly Google)) Deposition, p. 383 [redacted]

[169] Note that the commission rate is averaged by developer in each year. Google Transaction Data. *See* Rysman Workpapers.

for transactions via Google Play's billing system reduced by 4%."[170] Additionally, in the European Economic Area (EEA), Google recently announced "a new program to support billing alternatives for European Economic Area (EEA) users, allowing developers of non-gaming apps selling digital content or services the option of offering their users in the EEA an alternative to Google Play's billing system… When a consumer uses an alternative billing system, the service fee the developer pays will be reduced by 3%."[171] The changes in Google Play's commission structure are summarized in Exhibit 10 below:

Exhibit 10
Changes to Google Play Billing's Commission Tier

Target group	Effective Date	Commission tier
Developers who are enrolled in the 15% commission tier	July 1, 2021	15% for the first $1M (USD) of earnings each year
Developers who are enrolled in the 15% commission tier	July 1, 2021	30% for earnings in excess of $1M (USD) each year
Developers who are not enrolled in the 15% commission tier	Since at least 2012	30%
Developers who offer alternative in-app billing system in South Korea	December 18, 2021	Commission reduced by 4%
Automatically renewing subscription products purchased by subscribers	January 1, 2022	15%
Developers enrolled in User Choice Billing pilot program	September 1, 2022	Commission reduced by 4%

Note:
1. Commission tiers with an effective date since at least 2012 are indicated by the average commission rate across developers, based on Google Transaction data.
2. While Google is advertising a 4% reduction in the commission, Spotify, the only current member of the User Choice Billing program, pays Google a total commission of [redacted] subject to [redacted]. *See* Alzetta (Spotify) Deposition p. 43 [redacted]).

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[170] *See* Play Console Help, "Service fees," available at https://support.google.com/googleplay/android-developer/answer/112622. *See also* Park, Kate, "South Korea passes 'Anti-Google law' bill to curb Google, Apple in-app payment commission," August 31, 2021, available at https://techcrunch.com/2021/08/31/south-korea-passes-anti-google-law-bill-to-curb-google-apple-in-app-payment-commission/.

[171] *See* Play Console Help, "Offering an alternative billing system for users in the European Economic Area (EEA)," available at https://support.google.com/googleplay/android-developer/answer/12348241?hl=en&ref_topic=3452890.

Sources:
1. Google, "Service fees," 2022, available at https://support.google.com/googleplay/android-developer/answer/112622.
2. Google, "Enrolling in the user choice billing pilot," 2022, available at https://support.google.com/googleplay/android-developer/answer/12570971?hl=en.
3. Google, "Changes to Google Play's service fee in 2021," 2021, available at https://support.google.com/googleplay/android-developer/answer/10632485?hl=en.
4. Google Transaction Data.

76. Note that digital wallets such as Google Pay are different from in-app billing services like Google Play Billing. Google Pay is a payment system that allows consumers to store their credit card information in the "digital wallet" on their mobile device and make purchases or send money with their smartphones.[172] Transactions on Google Pay are executed via third-party "payment processors" (*e.g.*, Braintree and Stripe) employed by the app developer.[173] While Google Pay does not charge users or merchants for payments, merchants have to pay commissions to the payment processors they use.[174] Google Pay cannot generally be used to purchase apps on the Google Play Store or to purchase in-app content from the Google Play Store outside the U.S. and U.K.[175] Payment *methods*—such as credit cards, direct carrier billing, cash, and gift cards—are likewise distinct from in-app billing services.

6. *Google Play Points*

77. In 2018, Google launched the Google Play Points rewards program, which "rewards users for any purchase they make on Play — including apps, games, in-app items, music, movies, books, and subscriptions - and for downloading select apps and games" and lets participants use

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[172] *See*, *e.g.*, Google Play Help, "What is Google Pay?" available at https://support.google.com/pay/answer/9026749?hl=en-GB&co=GENIE.Platform%3DAndroid.

[173] A list of payment processors that support Google Pay can be found in Google Pay, "Participating processors," available at https://developers.google.com/pay/api#participating-processors.

[174] *See*, *e.g.*, Google Developers, "Frequently Asked Questions - Google Pay API," February 9, 2022, available at https://developers.google.com/pay/api/web/support/faq ("Google Pay doesn't additionally charge users, merchants, and developers additional fees to use the Google Pay API for payments. Merchants, specifically, continue to pay processing fees to their payment processor.").

[175] Play Console Help, "Accepted payment methods on Google Play," available at https://support.google.com/googleplay/answer/2651410 ("In the United States and United Kingdom, you can use your Google Pay balance to pay for your purchase. Simply make sure there's enough money in your Google Pay balance to cover the total amount of the purchase.").

points to get discount coupons, in-app items, or Google Play Credit.[176] Google initially launched Google Play Points in Japan and then South Korea and subsequently rolled out the program to 28 countries with plans to keep expanding (as of May 2022).[177] It was launched in the U.S. in November 2019.[178] The points system is tiered, allowing users who collect enough points in a calendar year to "level up," earning the user even more points and benefits.[179] In the U.S., users earn "1 point for every $1 USD [they] spend with Google Play."[180]

78. [redacted]"[181]

79. [redacted]

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[176] *See* 9to5Google, "Google Play Points rewards program goes official, only works in Japan for now," September 18, 2018 available at https://9to5google.com/2018/09/18/google-play-points-official-rewards-program-japan/. However, Google Play Store only expanded to the U.S. in 2019 (*See* AndroidGuys, "Google Play Store rewards program expands to US," November 4, 2019, available at https://www.androidguys.com/news/google-play-points-play-store-rewards-program). *See also* Google Play Help, "Join Google Play Points," available at https://support.google.com/googleplay/answer/9077312?hl=en&co=GENIE.CountryCode%3DU (hereafter "Join Google Play Points"); and Android Developers Blog, "Introducing Google Play Points in the U.S.," November 4, 2019, available at https://android-developers.googleblog.com/2019/11/introducing-google-play-points-in-us.html.

[177] *See* 9to5Google, "Google Play Points rewards program goes official, only works in Japan for now," September 18, 2018 available at https://9to5google.com/2018/09/18/google-play-points-official-rewards-program-japan/; Mu-Hyun, Cho, "Google Play introduces reward points in South Korea," *ZDNet*, April 22, 2019, available at https://www.zdnet.com/article/google-play-introduces-reward-points-in-south-korea/; Mok, Winston, "Google Play Points: a rewards program for all the ways you Play," November 4, 2019, available at https://www.blog.google/products/google-play/google-play-points-rewards-program-all-ways-you-play; and Google Play, "Google Play Points," available at https://play.google.com/console/about/programs/googleplaypoints/.

[178] Mok, Winston, "Google Play Points: a rewards program for all the ways you Play," November 4, 2019, available at https://www.blog.google/products/google-play/google-play-points-rewards-program-all-ways-you-play.

[179] *See* Join Google Play Points.

[180] Join Google Play Points. There is some variation in the program across certain geographies.

[181] *See* Google, "Play 2021/25," October 28, 2020, GOOG-PLAY-002650052.R-138.R, at 076.R.

the One store in Korea: [redacted][182]

80. Google expected increased loyalty would lead to increased spending and retain users within the Play Store. For example, when introducing the program, [redacted][183] [redacted].

[182] *See* Google, [redacted]" November 2, 2018, GOOG-PLAY-000286779.R-847.R, at 842.R. See also Chadhoury, Saheli Roy and Sam Shead, "South Korea passes bill limiting Apple and Google control over app store payments," *CNBC*, September 1, 2021, available at https://www.cnbc.com/2021/08/31/south-korea-first-country-to-curb-google-apples-in-app-billing-policies html.

[183] *See* Google, [redacted] November 2, 2018, GOOG-PLAY-000286779.R-847.R, at 781.R.

Exhibit 11

[redacted]

Source: Google Transaction Data.

81. [redacted][185]).

[184] Exhibit 11, Exhibit 12, and Exhibit 13 are based on a 10% random sample of the Google Transactions Data for 2012 to July 3, 2021. The developers are worldwide excluding Chinese developers. All transactions relate to U.S. consumers.

[185] Play Points analysis in Exhibit 12 and Exhibit 13 are based on a 10 percent random sample of the Google Transactions Data for the period 2012 to July 3, 2021. The developers are worldwide excluding Chinese developers. All transactions relate to U.S. consumers.

Exhibit 12

[redacted]

Source: Google Transaction Data.

Exhibit 13

[redacted]

Source: Google Transaction Data.

82. Further discussion and analysis of Google Play Points is provided in Section VII.B.4.

B. Google's Agreements with Carriers, OEMs, and Developers

83. Google's relationships with OEMs, MNOs, developers, and consumers relating to the Android OS and Google Play Store are governed by an array of complex and interconnected contracts. I summarize below my general understanding of these agreements, which is based on my team's review of Google's agreements and testimony from Google witnesses explaining them. Where appropriate, I generalize based on specific examples of these agreements; however, I understand Google entered these agreements with different partners, at different times, and some agreements may have custom amendments that others do not. My team has attempted to record, as shown in the exhibits in my report, a core set of agreements that Google has executed with the largest OEMs. My use of examples below is for illustrative purposes only; the actual terms of the agreements themselves governed particular partners. I reserve the right to offer testimony on any particular agreement if asked to do so.

84. Google's agreements with partners vary in the degree of "control" Google has over the particular device subject to the agreement, as depicted in the excerpt from a Google document in Exhibit 14 below.[186]

[186] Google, [redacted] May 23, 2013, GOOG-PLAY-009295801-815, at 814; Brady (Google) Deposition, p. 210 [redacted]

Exhibit 14

[redacted]

Source: Google, [redacted] May 23, 2013, GOOG-PLAY-009295801-815, at 814.

85. In the subsections that follow, I first summarize the categories of agreements that Google has entered into with OEMs and other Android-related documentation (see Sections IV.B.1-IV.B.5). I then summarize the agreements with developers that govern their publication of apps on the Google Play Store and their sale of apps and in-app content using Google Play Billing (see Section IV.B.6). Finally, I summarize the Google terms to which Android smart mobile device end-users must agree if they want to consummate a transaction for in-app content through Google Play (see Section IV.B.7).

1. Apache License

[redacted]

[redacted][187] The Apache 2.0 license does not require negotiations between Google and the partner; the partner agrees to its terms as a matter of course in distributing smart mobile devices with the Android OS.[188] The Apache 2.0 license grants a "perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable" copyright and patent license to reproduce or create derivative versions of the Android OS source code (*i.e.*, the AOSP code) but "does not grant permission to use the trade names, trademarks, service marks, or product names" for Android.[189] Amazon is an example of an OEM with an open-source Android license that has designed an Android fork.[190]

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[187] Android Open Source Project, "Content License," available at https://source.android.com/license#:~:text=The%20majority%20of%20the%20Android,under%20GPLv2%20or%20other%20license (hereafter "Content License"); Brady (Google) Deposition, pp. 42-43 ([redacted]

[188] Brady (Google) Deposition p. 208 [redacted] The Apache Software Foundation, "Apache License, Version 2.0," available at https://www.apache.org/licenses/LICENSE-2.0 (hereafter "Apache License, Version 2.0"), at §§ 2-3.

[189] Apache License, Version 2.0, § 6; *see also* Content License ("While the documentation itself is available to you under the Apache 2.0 license, note that proprietary trademarks and brand features are not included in that license. Google's trademarks and other brand features (including the android stylized typeface logo) are not included in the license."); and EC Google Android Decision, ¶ 156 ("The AOSP [Android Open Source Project] license further does not grant members of the Android ecosystem the right to use the Android logo and other Android related trademarks that Google owns.").

[190] *See* Morrill (Amazon) Deposition, p. 214 [redacted]. *See also*, Hines, Mike, "Over 75% of Android Tablet Apps We Tested Just Work on Kindle Fire, with No Additional Development Required," Amazon developer, August 21, 2013, available at https://developer.amazon.com/blogs/post/Tx5Z9RFM248DMJ/Over-75-Of-Android-Tablet-Apps-We-Tested-Just-Work-On-Kindle-Fire-With-No-Additi#; Stanton, William, "Is the Amazon Fire Tablet Considered an Android Device?" Alphr, April 13, 2020, available at https://www.alphr.com/amazon-fire-tablet-android-device/; Ziegler, Chris, "What is an 'Android device'?" The Verge, December 29, 2011, available at https://www.theverge.com/2011/12/29/2668214/what-is-an-android-device.

2. *Mobile Application Distribution Agreement ("MADA")*

87. Google's MADA agreements impose several requirements on OEMs. [redacted][191] [redacted][192] [redacted][193] [redacted][194] [redacted]

[191] Google, [redacted] November 1, 2017, GOOG-PLAY-009640439-467, at 445 [redacted]; Google, [redacted] April 1, 2017, GOOG-PLAY-000618261-281, at 264 [redacted] and Google, [redacted] January 1, 2011, GOOG-PLAY-000857382-393, at § 2.7 [redacted]

[192] *See, e.g.*, Google, [redacted] July 1, 2010, GOOG-PLAY-001089998-011, at § 2.2 and Google, [redacted] November 1, 2014, GOOG-PLAY-000617749 -766 , at 753.

[193] Google, [redacted] May 23, 2013, GOOG-PLAY-009295801-815, at 810 [redacted]; Brady (Google) Deposition, pp. 201-202 [redacted]; Li (Google) Deposition, p. 194 [redacted] and Email from Doug Yeum, Google, to Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, [redacted] April 27, 2010, GOOG-PLAY4-000341393-394, at 393 [redacted]

[194] *See, e.g.*, Google, [redacted] November 1, 2009, GOOG-PLAY-001477713-726 , at § 3(d)(2) [redacted] and 1.16, [redacted]

[redacted][195] [redacted].[196] [redacted][197]

88. [redacted][198] A summary of each MADA executed with major OEMs is attached as Appendix D.

3. *Anti-Fragmentation Agreement ("AFA") and Android Compatibility Commitment ("ACC")*

89. [redacted][199] [redacted]

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[195] *See, e.g.*, Google, [redacted] January 1, 2011, GOOG-PLAY-000857437-448, at 440 [redacted].

[196] Brady (Google) Deposition, pp. 202-203 ([redacted]

[197] *See, e.g.*, Google, [redacted] December 1, 2018, GOOG-PLAY-000808375-397, at 384 [redacted] Google, [redacted] July 1, 2017, GOOG-PLAY-000618559-581, at 567-568 [redacted]); and Rosenberg (Google) Deposition, p. 196-197 [redacted].

[198] Kolotouros (Google) Deposition, p. 93 [redacted]

[199] Brady (Google) Deposition, pp. 190-191 [redacted]

[redacted][200] [redacted]"[201]

90. In 2015, the European Commission opened proceedings "against Google to investigate … conduct in relation to its Android mobile operating system as well as applications,"[202] and to investigate, among other things, "whether Google has illegally hindered the development and market access of rival mobile applications or services by requiring or incentivising smartphone and tablet manufacturers to exclusively pre-install Google's own applications or services."[203] In July 2018, the EC concluded that, among other things, Google's "licensing of the Play Store and the Google Search app conditional on hardware manufacturers agreeing to the anti-fragmentation obligations in the AFAs…constitutes an abuse of Google's dominant positions in the worldwide market (excluding China) for Android app stores."[204,205]

91. Following the European Commission's investigation into Google's Android business practices, Google "informed the Commission of its intention to notify hardware manufacturers of the option to enter into an 'Android Compatibility Commitment' ('ACC') in place of an AFA."[206] I

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[200] [redacted] May 9, 2012, GOOG-PLAY-003604523-525, at 523.

[201] [redacted] May 9, 2012, GOOG-PLAY-003604523-525, at 523.

[202] European Commission, "Antitrust: Commission sends Statement of Objections to Google on Android operating system and applications," April 20, 2016, *available at* https://ec.europa.eu/commission/presscorner/detail/en/IP_16_1492.

[203] *See* European Commission, "Antitrust: Commission opens formal investigation against Google in relation to Android mobile operating system," available at https://ec.europa.eu/commission/presscorner/detail/en/MEMO_15_4782.

[204] "Summary of Commission Decision of 18 July 2018 relating to a proceeding under Article 102 of the Treaty on the Functioning of the European Union and Article 54 of the EEA Agreement (Case AT.40099 – Google Android)," *Official Journal of the European Union*, November 28, 2019, ¶¶ 18-20, available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019XC1128(02)&from=EN.

[205] On September 14, 2022, the Court of Justice of the European Union "largely confirms the Commission's decision that "Google imposed unlawful restrictions on manufacturers of Android mobile devices," and imposing a fine of €4.125 billion. *See* Court of Justice of the European Union, "Judgment of the General Court in Case T-604/18 | *Google and Alphabet v Commission (Google Android)*," September 14, 2022.

[206] *See* EC Google Android Decision, ¶ 170; Li (Google) Deposition. pp. 118-119 [redacted]

[redacted][07] [redacted][208] [redacted][209] [redacted][210]

92. Following the EC Google Android Decision, I understand Google has not enforced the ACC requirements in the European Economic Area ("EEA") since October 19, 2018, permitting OEMs to offer first-party non-compatible Android smart mobile devices in the EEA only.[211]

4. *Android Compatibility Test Suite ("CTS") and Compatibility Definition Document ("CDD")*

93. For an OEM to market its device as an Android device, the OEM's implementation of Android must (1) be compatible with the standardized Android build that Google specifies in the

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[207] [redacted] *See* Kolotouros (Google) Deposition, p. 92 [redacted] Appendix D summarizes the major OEMs that have executed MADAs.

[208] Google, [redacted] GOOG-PLAY-000128863.R-908.R, at 877.R; Google, "[redacted] November 18, 2020, GOOG-PLAY-001090167-170, at 167.

[209] Google, [redacted] February 2, 2018, GOOG-PLAY-001559464.R-496.R, at 477.R [redacted] EC Google Android Decision ¶ 171.

[210] Google, [redacted] (February 2, 2018, GOOG-PLAY-001559464.R-496.R, at 477.R.

[211] Lockheimer, Hiroshi, "Complying with the EC's Android decision," *Google*, October 16, 2018, available at https://www.blog.google/around-the-globe/google-europe/complying-ecs-android-decision/ ("First, we're updating the compatibility agreements with mobile device makers that set out how Android is used to develop smartphones and tablets. Going forward, Android partners wishing to distribute Google apps may also build non-compatible, or forked, smartphones and tablets for the European Economic Area (EEA)").

Android Compatibility Definition Document ("CDD"),[212] and (2) pass a software test that evaluates a device's compliance with aspects of the CDD known as the Compatibility Test Suite ("CTS").[213] Each version of Android has a corresponding CDD.[214] While Google might solicit input from partners and modify the CDD in response to that input, Google publishes the CDD and retains final control over the contents of the CDD.[215] The CDD has numerous requirements; for example, it governs screen size so that the Android user interface displays properly.[216]

94. The current CDD for Android 12 states that the OEM's implementation of Android OS contains requirements regarding "unknown sources" and potentially harmful applications:[217]

- "MUST NOT install application packages from unknown sources, unless the app that requests the installation meets all the following requirements: It MUST declare the REQUEST_INSTALL_PACKAGES permission or have the android:targetSDKVersion set at 24 or lower. It MUST have been granted permission by the user to install apps from unknown sources."

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[212] Android Open Source Project, "Android Compatibility Definition Document," available at https://source.android.com/compatibility/cdd (hereafter "Android Compatibility Definition Document").

[213] Android Open Source Project, "Compatibility Test Suite," available at https://source.android.com/compatibility/cts and Android Open Source Project, "Android Compatibility Program Overview," available at https://source.android.com/compatibility/overview.

[214] Android Compatibility Definition Document ("For each release of the Android platform, a detailed CDD will be provided."), https://source.android.com/docs/compatibility/cdd, *visited* Sept. 30, 2022.

[215] Rosenberg (Google) Deposition, p. 189 ([redacted] Brady (Google) Deposition, p. 443 [redacted]; Li (Google) Deposition, pp. 124-125 [redacted] and EC Google Android Decision, ¶¶ 163 ("The conditions for the Android compatibility tests are determined at Google's sole discretion") and 1072 ("Google may change the specific CDD/CTS clauses at any time, given that it has the right to amend them unilaterally.").

[216] Android 12, "Compatibility Definition," at § 7.1.1, available at https://source.android.com/docs/compatibility/android-cdd.pdf. *See* Li (Google) Deposition, pp. 493-494.

[217] Android 12, "Compatibility Definition," at § 4 C-0-6 and C-0-7, available at https://source.android.com/docs/compatibility/android-cdd.pdf.

- "MUST display a warning dialog with the warning string that is provided through the system API PackageManager.setHarmfulAppWarning to the user before launching an activity in an application that has been marked by the same system API PackageManager.setHarmfulAppWarning as potentially harmful."

As described in further detail below, I understand (i) [redacted][218] and (ii) to overcome this setting, the user must navigate to "Settings" in the Android UI, select "Install unknown apps," and then grant permissions to an alternative app store or a browser (for sideloading or direct downloading) to install apps.[219]

95. Thus, based on the documents and testimony I have reviewed, I understand the current version of Android OS requires the user to proceed through two rounds of granting permissions in the smart mobile device Settings – first to sideload the app store and then to install an app from that sideloaded app store – to enable app install permissions from each app that the user wishes to install. Each round involves clicking "Settings" on a warning pop-up, enabling the installation on the Settings page, and then again confirming that a user wishes to install the app in response to a second pop-up.

96. As depicted in Exhibit 14 above, Google notes that its CDD and CTS agreements are at the lower end of its spectrum of "control" over smart mobile devices running Android.

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[218] Cunningham (Google) Deposition, pp. 405-406 [redacted] Cunningham (Google) Deposition, p. 407 [redacted]

[219] Samsung, "Galaxy phone or tablet won't install apps from unknown sources," available at https://www.samsung.com/us/support/troubleshooting/TSG01001353/ ("By default, your Galaxy phone or tablet is set to prohibit apps from being installed from sources other than the Play Store and Galaxy Store. However, you can change this setting if desired.").

[redacted] described in IV.B.4.[220]

5. *Revenue Sharing Agreement ("RSA")*

97. [redacted][221]

98. [redacted][222] [redacted][223] With the launch of paid transactions on Android Market (for paid apps, as paid in-app content was a later innovation[224]), [redacted]

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[220] *See, e.g.,* Google, [redacted] November 1, 2017, GOOG-PLAY-009640439-467, at 445 [redacted] Rosenberg (Google) Deposition, pp. 188-189 [redacted] Android 12, "Compatibility Definition," at § 10.1, available at https://source.android.com/docs/compatibility/android-cdd.pdf; and Google, "Android 101," GOOG-PLAY-000128863.R-908.R, at 877.R.

[221] Li (DOJ) Deposition, p. 199 [redacted]. Jamie Rosenberg, Vice President of strategy for platforms and ecosystems at Google, explained that [redacted] *See* Google, "Deposition of Jamie Rosenberg in the Matter of: In Re – Google Antitrust Litigation," July 14, 2020, GOOG-PLAY-007847148-353, at 273-277.

[222] *See, e.g.*, PX1084, [redacted] (Oct. 2012), GOOG-PLAY-003772918.R, at 924.R [redacted]

[223] Sears (Google) Deposition, pp. 130-131 [redacted]

[224] Android Developers Blog, "In-app Billing Launched on Android Market," March 29, 2011, available at thttps://android-developers.googleblog.com/2011/03/in-app-billing-launched-on-android html.

[redacted][225] Eventually, [redacted].[226] [redacted][228] [redacted][229] See Exhibit 15 below, depicting this "Change in Play terms."

[225] Email from Nick Sears, Google, to David Conway, Google, [redacted] February 11, 2009, GOOG-PLAY-005559853-854, at 853 [redacted]

[226] *See, e.g.*, PX1084, [redacted] October 2012, GOOG-PLAY-003772918.R, at 920.R, 924.R.

[227] [redacted] *See* Brady (Google) Deposition, p. 467 [redacted] Chu (Meta Platforms (formerly Google)) Deposition, p. 108 [redacted] *See also*, Email from Eric Chu to John Lagerling, March 9, 2011, GOOG-PLAY-005668326, at 326 [redacted].

[228] Email from Cristina Bita, Google, to Patrick Pichette, Google, Jonathan Gold, Finance Manager for Android at Google, and Tim Riitters, Google, [redacted] May 7, 2013, GOOG-PLAY-003741416-420, at 417-418.

[229] *See, e.g.*, Google, [redacted] May 6, 2015, GOOG-PLAY-001184813-857, at 823 [redacted] *See also* GOOG-PLAY4-004677224-229, at 225.

Exhibit 15

[redacted]

Source: Email from Cristina Bita, Google, to Patrick Pichette, Google, Jonathan Gold, Finance Manager for Android at Google, and Tim Riitters, Google, [redacted] May 7, 2013, GOOG-PLAY-003741416-420, at 418.

99. In 2013, Google began reducing the percentage of revenue it shared with MNOs, eventually eliminating any payments to mobile carriers. [redacted]

[230] *See*, [redacted]' 2013, ATT-GPLAY-00000692-711, at 705; Google, [redacted]' 2013, GOOG-PLAY-003604606-625, at 619;and Google, [redacted]' 2015, GOOG-PLAY-003604601-604, at 603.

[redacted]

[redacted][232]

100. [redacted][233]

101. [redacted][234] [redacted][235] [redacted][236] [redacted]

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[232] Google, [redacted] 2015, GOOG-PLAY-003605103-106, at 106; GOOG-PLAY4-002178049; Email from Matt Schwartz to Jamie Rosenberg, Vice President of Strategy and Operations (Platforms and Ecosystems Division) at Google, Zahavah Levine, Google, TT Ramgopal, Google, Christian Veer, Google, Paul Gennai, Product Management Director at Google, [redacted] GOOG-PLAY-002891881-882.

[233] Email from Cristina Bita, Google, to Patrick Pichette, Google, Jonathan Gold, Finance Manager for Android at Google, and Tim Riitters, Google, [redacted] May 7, 2013, GOOG-PLAY-003741416-420, at 417.

[234] Google, [redacted] GOOG-PLAY-000443763.R-798.R, at 775.R; and Google, "Premier Tier Requirements," July 31, 2021, GOOG-PLAY-007125883-889, at 885-886 [redacted]. *See,* e.g., Google and BLU Products, [redacted] April 1, 2020, GOOG-PLAY-005706676-704.

[235] Gold (Google) Deposition, p. 256 [redacted]; Kolotouros (Google) Deposition, p. 225 [redacted]

[236] Google, [redacted] Google-HMD, GOOG-PLAY-000620282-321, at 305 (up to 10% of Net Play Revenue); Google-Xiaomi RSA, GOOG-PLAY-000620210, at 235 [redacted]

[redacted][237] [redacted][238]

[redacted]

102. [redacted]

[237] [redacted] February 7, 2020, GOOG-PLAY-006390054. *See also* Kolotouros (Google) Deposition, pp. 338-339 [redacted] Google, "[redacted]," July 31, 2021, GOOG-PLAY-007125883-889, at 886 [redacted] and 887 [redacted]

[238] Google, [redacted] 2019, GOOG-PLAY-000620282-321, at 292 (emphasis added).

[redacted][239] [redacted][240]

6. Google Play Developer Distribution Agreement ("DDA")

103. To distribute apps on the Google Play Store, a developer must have a Google Play Developer Account, pay a registration fee of $25, and comply with the Developer Distribution Agreement ("DDA"), Google's Developer Program Policies, and related policies.[241] The DDA states that developers "may not use Google Play to distribute or make available any Product that has a purpose that facilitates the distribution of software applications and games for use on Android devices outside of Google Play."[242] The DDA in turn requires developers to comply with the Developer Program Policy, which states that "an app may not download executable code (*e.g.*, dex, JAR, .so files) from a source other than Google Play."[243]

104. The DDA and related policies also require the developer to use Google Play Billing as the billing solutions provider for app downloads and in-app purchases.[244] The DDA requires developers to "have a valid Payment Account under a separate agreement with a [Google] Payment

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[239] Google, [redacted] 2019, GOOG-PLAY-000620282-321, at 310.

[240] Google, [redacted] 2019, GOOG-PLAY-000620282-321, at 295. [redacted]

[241] Google, "How to use Play Console," available at https://support.google.com/googleplay/android-developer/answer/6112435?hl=en-GB. *See also* Google, "Policy Centre," available at https://support.google.com/googleplay/android-developer/topic/9858052#zippy=.

[242] Google, "Google Play Developer Distribution Agreement," (hereafter "Google Play DDA"), § 4.5, November 17, 2020, GOOG-PLAY-000053875-878, at 875, available at https://play.google.com/about/developer-distribution-agreement html.

[243] "Developer Program Policy," effective September 28, 2022, available at https://support.google.com/googleplay/android-developer/answer/12766072?visit_id=638004251869883965-3060563484&rd=1.

[244] *See* Google, "Google Play Payments Policy," available at https://support.google.com/googleplay/android-developer/answer/9858738, §§ 1-2 (Google also requires app developers to comply with its payment policy, where "any apps existing as of 20 September 2020 that used an alternative in-app billing system needed to remove it as of 30 September 2021 to be in compliance[.]" However, it allows extensions to developers and evaluates such requests "on an app-by-app basis with a latest possible date of compliance of 31 March 2022."). *See also* Google, "Understanding Google Play's Payments policy," available at https://support.google.com/googleplay/android-developer/answer/10281818?hl=en.

Processor" in order to "charge a fee" for digital in-app content.[245] Further, the Developer Program Policy states that developers "Play-distributed apps requiring or accepting payment for access to in-app features or services, including any app functionality, digital content or goods (collectively "in-app purchases"), must use Google Play's billing system for those transactions."[246] By way of example, Google requires consumers to use Google Play Billing to purchase digital items ("such as virtual currencies, extra lives, additional playtime, add-on items, characters and avatars"), subscription services ("such as fitness, game, dating, education, music, video, service upgrades and other content subscription services"), app functionality or content ("such as an ad-free version of an app or new features not available in the free version"), and cloud software and services ("such as data storage services, business productivity software, and financial management software").[247] Moreover, Google generally prohibits developers from leading users to "a payment method other than Google Play's billing system" for in-app purchases of digital content (*e.g.*, by embedding a direct link to the developers' website containing an alternative payment method).[248,249]

105. By contrast, Google does not require developers to use Google Play Billing for the purchase of physical goods and services consumed outside the app, payments of credit card bills or utility bills, peer-to-peer transactions, payments related to online auctions, tax exempt donations,

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[245] Google Play DDA, § 3.2.

[246] "Developer Program Policy," effective September 28, 2022, available at https://support.google.com/googleplay/android-developer/answer/12766072?visit_id=638004251869883965-3060563484&rd=1

[247] Google, "Payments," available at https://support.google.com/googleplay/android-developer/answer/9858738?hl=en .

[248] *See* Google, "Payments," available at https://support.google.com/googleplay/android-developer/answer/9858738?hl=en, § 4.

[249] In March 2022, Google announced a pilot program to allow non-game Android apps to use their own payment system if they also offered Google Play Billing as an option, and Spotify was the inaugural "User Choice Billing" partner. In September 2022, Google opened the User Choice Billing pilot to non-game developers in the European Economic Area, Australia, India, Indonesia, and Japan. *See* Samat, Sameer, "Exploring User Choice Billing With First Innovation Partner Spotify," March 23, 2022, available at https://android-developers.googleblog.com/2022/03/user-choice-billing html ("This pilot will allow a small number of participating developers to offer an additional billing option next to Google Play's billing system and is designed to help us explore ways to offer this choice to users, while maintaining our ability to invest in the ecosystem. This is a significant milestone and the first on any major app store — whether on mobile, desktop, or game consoles."); Play Console Help, "Enrolling in the user choice billing pilot," available at https://support.google.com/googleplay/android-developer/answer/12570971; Li, Abner, "Google Play opens developer sign-ups for third-party 'User Choice Billing,'" *9to5Google*, September 1, 2022, available at https://9to5google.com/2022/09/01/google-play-user-billing-sign-up/.

and payments that facilitate online gambling.[250] In fact, Google requires that payments related to those activities "must not" be processed on Google's own IAP system.[251] In addition, Google allows developers to offer a "consumption only" app where users can access content that has been paid somewhere else; in this instance, there are no payment options within the app and developers may not provide information to users to pay outside the app.[252]

106. The developer has the "sole discretion" to set prices for apps it publishes in Google Play and the in-app content within such apps.[253] The DDA does limit pricing in that the developer agrees that any products "that were initially offered free of charge to users will remain free of charge" and "[a]ny additional charges will correlate with an alternative or supplemental version of the Product."[254] Google "may give refunds for some Google Play purchases" within 48 hours of the app or in-app purchase,[255] and the DDA gives Google the power to make those refunds by deducting the refund amount from the developer's revenue share payments.[256] Outside that window, the DDA specifies that the developer "will be solely responsible, and Google will have no responsibility, for undertaking or handling the support and maintenance" of the developer's apps or in-app content "and any complaints" from customers.[257] The DDA further commits the developer to "respond to customer support inquiries [for paid products or in-app transactions] within 3

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[250] Google, "Payments," available at https://support.google.com/googleplay/android-developer/answer/9858738, at § 3.

[251] *See* Google, "Payments," available at https://support.google.com/googleplay/android-developer/answer/9858738, at § 3.

[252] *See, e.g.* , Google, "Understanding Google Play's payments policy – Frequently asked questions," available at https://support.google.com/googleplay/android-developer/answer/10281818?hl=en-GB#zippy=%2Ccan-i-offer-a-consumption-only-reader-app-on-google-play. ("Google Play allows any app to be consumption-only, even if it is part of a paid service. For example, a user could log in when the app opens and access content paid for somewhere else.")

[253] Google Play DDA, at § 3.3 ("Products are displayed to users at prices You establish in Your sole discretion.").

[254] Google Play DDA, at § 3.7.

[255] Google, "Learn about refunds on Google Play," available at https://support.google.com/googleplay/answer/2479637?hl=en#:~:text=If%20you%20haven%27t%20started,65%20days%20of%20your%20purchase.

[256] Google Play DDA, at § 3.8 ("You authorize Google to give users refunds in accordance with the Google Play refund policies as located here or the local versions made available to You, and You agree that Google may deduct the amount of those refunds from payments to you.").

[257] Google Play DDA, at § 4.7.

business days, and within 24 hours to any support or Product concerns stated to be urgent by Google."[258]

7. Google Reduced Commission Developer Programs and Agreements

107. Google historically took 30% of the app price or in-app purchase price as its own revenue (setting aside carrier payments) and remitted the remaining 70% of consumer spending to developers.[259] In recent years, Google made some limited changes to its 30% commission. For example, beginning on January 1, 2018, for automatically renewing subscription products, Google lowered its commission to 15% beginning in year two of the subscription.[260] On July 1, 2021, Google lowered its commission from 30% to 15% on the first $1 million in a developer's consumer spending.[261] On January 1, 2022, Google then lowered the commission on the first year in in-app subscriptions to 15% from 30%.[262] Google has also offered reductions on these general terms, providing some reduced commissions as part of special developer programs or in on-on-one deals with certain developers. Exhibit 16 below depicts various reduced commission programs and

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[258] Google Play DDA, at § 4.7.

[259] *See* Google, "Transaction fees for merchants," available at https://web.archive.org/web/20220305213757/https://support.google.com/paymentscenter/answer/7159343?hl=en. *See also* Rasanen (Google) Deposition, p. 227 [redacted] and Email from Jon Gold, Google, to Cristina Bita, Google, [redacted] May 8, 2013, GOOG-PLAY-003741416, at -417 [redacted]

[260] Statt, Nick, "Google matches Apple by reducing Play Store fee for Android app subscriptions," *The Verge*, October 19, 2017, available at https://www.theverge.com/2017/10/19/16502152/google-play-store-android-apple-app-store-subscription-revenue-cut and Buch, Vineet, "Playtime 2017: Find success on Google Play and grow your business with new Play Console features," *Google*, October 19, 2017, available at https://android-developers.googleblog.com/2017/10/playtime-2017-find-success-on-google html ("Finally, from January 2018 we're also updating our transaction fee for subscribers who are retained for more than 12 months").

[261] Samat, Sameer, "Boosting developer success on Google Play," *Android Developers Blog,* March 16, 2021, available at https://android-developers.googleblog.com/2021/03/boosting-dev-success html ("Starting on July 1, 2021 we are reducing the service fee Google Play receives when a developer sells digital goods or services to 15% for the first $1M (USD) of revenue every developer earns each year").

[262] Samat, Sameer, "Evolving our business model to address developer needs," *Android Developers Blog*, October 21, 2021, available at https://android-developers.googleblog.com/2021/10/evolving-business-model.html ("To help support the specific needs of developers offering subscriptions, starting on January 1, 2022, we're decreasing the service fee for all subscriptions on Google Play from 30% to 15%, starting from day one").

special deal agreements that Google has offered and entered into with developers, for which I was able to find information in the record.[263]

[263] Additional information on these programs and offers in Section VII.B.1 and Appendix E.

Exhibit 16

[redacted]

Source: *See* Appendix E.

108. Notably, Google documents and witness testimony indicates these special deals were aimed at inhibiting third-party app distribution and retaining (or attracting) developers in Google

Play Billing. [redacted][264] [redacted][265] [redacted][266]

Exhibit 17

[redacted]

[264] Google, "Business Model / Policy," GOOG-PLAY-004502766.R-771.R, at 769.R.

[265] Email from George Yousling, Google, to Lawrence Koh, former Director and Global Head of Games Business Development at Google, [redacted] February 18, 2020, GOOG-PLAY-000928690-692, at 691. *See also* Koh (EA (formerly Google)) Deposition, pp. 13-21 [redacted]

[266] Google, [redacted] GOOG-PLAY-000464148-153, at 151.

[redacted]

Source: Google, "Business Model / Policy," GOOG-PLAY-004502766.R-771.R, at 769.R.

109. One program noted in Exhibit 17 is [redacted][267] [redacted][268] [redacted]

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[267] Marchak (Google) Deposition, pp. 257-258; GOOG-PLAY-006998204.R-211.R, at 206.R.

[268] Email from Samer Sayigh, Google, to Lei Zhang, Google, and Mike Marchak, Director of Play Partnerships, Strategy and Operations for Google, [redacted] October 9, 2018, GOOG-PLAY-004595170-172, at 170-171; Google, Untitled, GOOG-PLAY-000237792-797, at 792-793; 795-797; Marchak (Google) Deposition, pp. 70, 257. *See also* Google, [redacted] December 2020, GOOG-PLAY-004146689.R-757.R, at 692.R-695.R and 709.R-713.R; and Marchak (Google) Deposition, pp. 380-382 [redacted]

[redacted][270] [redacted][271]

110. [redacted][272] [redacted][273]Another special program noted in Exhibit 17 above [redacted][274] The goal of the

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[269] Google, [redacted] December 2020, GOOG-PLAY-004146689.R-757.R, at 694.R; Marchak (Google) Deposition, pp. 379-381. [redacted] *See* Email from Purnima Kochikar, Google, to James Kolotouros, Vice President, Android Platform Partnerships, for Google, "[redacted]," June 12, 2019, GOOG-PLAY-001877016.C-022.C, at 019.C [redacted]

[270] PX1577, [redacted] (Aug. 18, 2021), GOOG-PLAY-011271413-442, at -414.

[271] *See, e.g.*, Google and Activision, [redacted] January 25, 2020, GOOG-PLAY-007273439-444, at § 3.A, B.

[272] Google, [redacted] GOOG-PLAY-000566853-914, at 863 [redacted]

[273] Google, [redacted] April 9, 2019, GOOG-PLAY-003332817.R-864.R, at 839.R.

[274] Rosenberg (Google) Deposition, pp. 99, 110-111, and 152 ([redacted]

[redacted][275] [redacted][276] [redacted].[277]

111. Exhibit 17 also [redacted][27][redacted] [redacted][279]

112. Additional information on other Google special programs and offers listed in Exhibit 16 above is included in Section VII.B.1 below.

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d[redacted] June 20, 2019, GOOG-PLAY4-004259430-432, at 430.

[275] Google, [redacted] June 20, 2019, GOOG-PLAY4-004259430-432, at 430.

[276] Google, [redacted] June 20, 2019, GOOG-PLAY4-004259430-432, at 431.

[277] Google, [redacted] June 20, 2019, GOOG-PLAY4-004259430-432, at 432.

[278] Marchak (Google) Deposition, p. 105. *See also* Google, [redacted] June 2019, GOOG-PLAY-003938581.R-614.R, at 594.R.

[279] Email from Wendy-Kay Logan, Google, to Mike Marchak, Director of Play Partnerships, Strategy and Operations for Google, "Subject: Re: Recap of sync with Sameer," August 2, 2019, GOOG-PLAY-001214798-799, at 798.

C. Overview of the Challenged Conduct

113. The States allege Google has monopolized the Android App Distribution Market and tied Google Play Billing to Android App Distribution through the Google Play Store ("Google's challenged conduct"). The States' Amended Complaint addresses several aspects of Google's conduct, including:

- The CDD's requirement for OEMs to create an "unknown sources" dialog box for app installations from sources besides Google Play or app store that have been pre-loaded onto the device that bypass that permission;[280]
- The MADA requirement that OEMs preload the Play Store icon on the default home screen;[281]
- The bundling of Google Play with more than 10 GMS apps including YouTube, Google Maps, and Gmail, and associated key APIs under the MADA;[282]
- Google's exclusive dealing or "no duplication of services" clauses in RSAs and elsewhere prohibiting MNOs or OEMs from pre-loading third-party app stores on their smart mobile devices in exchange for a share of revenue from Google Play;[283]
- Google's refusal to publish competing app stores on Google Play;[284]
- Google's incentive payments to developers in exchange for contractual commitment not to launch exclusive titles on competing app stores;[285]
- Google's tie of Google Play with Google Play Billing for in-app billing services;[286] and

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[280] First Amended Complaint, ¶¶ 83-106. *See* Cunningham (Google) Deposition, p. 407 [redacted].

[281] First Amended Complaint, ¶¶ 124-27.

[282] First Amended Complaint, ¶¶ 116-123 and 128-29.

[283] First Amended Complaint, ¶¶ 130-135; Brady (Google) Deposition, p. 119.

[284] First Amended Complaint, ¶¶ 107-110.

[285] First Amended Complaint, ¶¶ 135, 139, and 147-48.

[286] First Amended Complaint, ¶¶ 161-228.

- Google's anti-steering rules prohibiting developers from advertising lower commission fees outside of Google Play in their apps.[287]

114. To assess this conduct, I begin with market definition.

V. Market Definition

A. Antitrust Principles of Market Definition

1. Basics of Market Definition

115. Market definition is a standard antitrust framework for identifying the boundaries of competition relevant to anticompetitive conduct.[288] However, market definition is just the first step in measuring market power and assessing anticompetitive conduct. As noted in the *U.S. Merger Guidelines* jointly published by the U.S. Department of Justice and the Federal Trade Commission, "[t]he measurement of market shares and market concentration is not an end in itself, but is useful to the extent it illuminates…competitive effects."[289] This view is supported by the UK's Office of Fair Trading (the CMA's predecessor):

> Market definition is not an end in itself but a key step in identifying the competitive constraints acting on a supplier of a given product or service. Market definition provides a framework for competition analysis. For example, market shares can be calculated only after the market has been defined and, when considering the potential for new entry, it is

[287] First Amended Complaint, ¶ 202.

[288] See *U.S. Merger Guidelines*, at § 4 ("When the Agencies identify a potential competitive concern with a horizontal merger, market definition plays two roles. First, market definition helps specify the line of commerce and section of the country in which the competitive concern arises. In any merger enforcement action, the Agencies will normally identify one or more relevant markets in which the merger may substantially lessen competition. Second, market definition allows the Agencies to identify market participants and measure market shares and market concentration."). *See also* European Commission, "Commission Notice on the definition of relevant market for the purposes of Community competition law," *Official Journal of the European Communities*, Vol. 40, 1997, pp 5-13, available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31997Y1209(01)&from=EN (hereafter "Commission Notice"), at ¶ 2 ("Market definition is a tool to identify and define the boundaries of competition between firms. It serves to establish the framework within which competition policy is applied by the Commission. The main purpose of market definition is to identify in a systematic way the competitive constraints that the undertakings involved face. The objective of defining a market in both its product and geographic dimension is to identify those actual competitors of the undertakings involved that are capable of constraining those undertakings' behaviour and of preventing them from behaving independently of effective competitive pressure.").

[289] U.S. Merger Guidelines, § 4.

necessary to identify the market that might be entered. Market definition is usually the first step in the assessment of market power.[290]

116. The economics literature recognizes that "[m]arket definition is least useful when market shares would not be strongly probative of market power or anticompetitive effect, while direct evidence as to market power or anticompetitive effect is available and convincing."[291] Indeed, though defining a relevant market is a common first step is assessing conduct, it is not a necessary step in determining whether a firm has market power.[292]

117. Market definition typically centers on demand-side substitution, evaluating the reasonably interchangeable choices available to consumers, such that they would form a relevant antitrust market.[293] That is, demand-side substitution is the extent to which consumers of a product sold by one firm (Product A) would substitute to a product sold by another firm (Product B) in response to a small but significant non-transitory increase in price ("SSNIP") in Product A. The Hypothetical Monopolist Test ("HMT") is a framework that can be used to define the boundaries of a relevant market. The HMT is summarized in the *U.S. Merger Guidelines*:[294]

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[290] *See* UK Office of Fair Trading, "Market Definition," December 2004, available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/284423/oft403.pdf.

[291] Baker, Jonathan B., "Market definition: An analytical overview," *Antitrust LJ* , Vol 74, 2007, pp. 129-173, available at https://heinonline.org/HOL/LandingPage?handle=hein.journals/antil74&div=8&id=&page=, at p. 131.

[292] *See*, *e.g.*, Baker, Jonathan B., and Timothy Bresnahan, "Economic Evidence in Antitrust - Defining Markets and Measuring Market Power," in *Handbook of Antitrust Economics*, Ed. Paolo Buccirossi, Cambridge, MA: The MIT Press, 2008, pp. 1-43, at p. 3 (highlighting that "settings where the competitive effects of business conduct can be measured directly [are] settings where economists might find market definition unnecessary"); and Kaplow, Louis, "Why (Ever) Define Markets," *Harvard Law Review*, Vol. 124, No. 2, December 2010, pp. 437-517, at p. 446 (arguing that "[T]he role of the market definition / market share paradigm is, on its face, obscure. Market shares, whether in a properly defined relevant market or in any other, do not appear in the definition of market power. Instead, one only sees price and marginal cost. It would seem that, if one wished to know the level of market power, one would, therefore, examine price and marginal cost.").

[293] U.S. Merger Guidelines, § 4.

[294] *U.S. Merger Guidelines*, § 4.1.1. The European Commission takes a consistent approach to market definition: "The question to be answered is whether the parties' customers would switch to readily available substitutes or to suppliers located elsewhere in response to a hypothetical small (in the range 5 % to 10 %) but permanent relative price increase in the products and areas being considered. If substitution were enough to make the price increase unprofitable because of the resulting loss of sales, additional substitutes and areas are included in the relevant market. This would be done until the set of products and geographical areas is such that small, permanent increases in relative prices would be profitable." *See* Commission Notice, ¶ 17.

> Specifically, the test requires that a hypothetical profit-maximizing firm, not subject to price regulation, that was the only present and future seller of those products ("hypothetical monopolist") likely would impose at least a small but significant and non-transitory increase in price ("SSNIP") on at least one product in the market, including at least one product sold by one of the merging firms. For the purpose of analyzing this issue, the terms of sale of products outside the candidate market are held constant.

118. Thus, the hypothetical monopolist framework (often measured through the above-defined SSNIP test) can estimate the substitution between two products to determine whether they are in the same relevant market. The *U.S. Merger Guidelines* further explain that "[g]roups of products may satisfy the [HMT] without including the full range of substitutes from which customers choose."[295]

119. However, as described above, the HMT focuses on the "present and future" seller imposing a SSNIP; that is, it is not a backward-looking but a forward-looking analysis. In a merger context, authorities seek to understand the likely impact if a merged firm raised prices post-merger. By contrast, while the HMT can be applied in conduct cases where an analysis of the historical market is required,[296] the actual world has likely been affected by the alleged anticompetitive conduct, thereby increasing the chance the HMT and SSNIP will define a market that is too wide. This is because a profit-maximizing monopolist may have already increased the price to a point where even inferior goods (that would be outside a relevant market under competitive conditions) become substitutes (the so-called cellophane fallacy).[297] I consider the implications of the cellophane fallacy when implementing the HMT in Section V.C.5 below.

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[295] U.S. Merger Guidelines, § 4.1.1.

[296] There are numerous discussions on how historical evidence can be used to operate a HMT. *See* Harkrider, John and Axinn, Veltrop & Harkrier, LLP, "Operationalizing the hypothetical monopolist test," *U.S. Department of Justice*, June 15, 2015, available at https://www.justice.gov/atr/operationalizing-hypothetical-monopolist-test.

[297] *See* "Appeal from the United States District Court for the District of Delaware," *United States* v. *E.I. du Pont de Nemours & Co.*, Case No. 351 U.S. 377, 1956. The "Cellophane Fallacy" is where DuPont (the sole manufacturer of cellophane) had increased the price of cellophane to a point where other flexible wrapping materials became substitutes. DuPont tried to argue that this substitution / switching resulting from a SSNIP proved these inferior goods were in the market. But DuPont's analysis did not conduct the SSNIP at the competitive level, not the prevailing (potentially anti-competitive) market price, and therefore risked defining the market as too wide.

120. To estimate consumers' likely response to a change in price, the *U.S. Merger Guidelines* permit considering "any reasonably available and reliable evidence" including:

- "how customers have shifted purchases in the past in response to relative changes in price or other terms and conditions;
- information from buyers, including surveys, concerning how they would respond to price changes;
- the conduct of industry participants, notably: sellers' business decisions or business documents indicating sellers' informed beliefs concerning how customers would substitute among products in response to relative changes in price; industry participants' behavior in tracking and responding to price changes by some or all rivals;
- objective information about product characteristics and the costs and delays of switching products, especially switching from products in the candidate market to products outside the candidate market[.]"[298]

121. The *U.S. Merger Guidelines* also note that:

> Even when the evidence necessary to perform the hypothetical monopolist test quantitatively is not available, the conceptual framework of the test provides a useful methodological tool for gathering and analyzing evidence pertinent to customer substitution and to market definition. The Agencies follow the hypothetical monopolist test to the extent possible given the available evidence, bearing in mind that the ultimate goal of market definition is to help determine whether the merger may substantially lessen competition.[299]

Therefore, even if the precise quantitative evidence is not available for the HMT (or SSNIP test), the conceptual framework can be used to analyze the evidence on customer substitution and, thus, inform the boundaries of a relevant market.

122. In the sections that follow, I have been asked by counsel to evaluate qualitative factors to consider reasonably available and reliable evidence for evaluating the boundaries of the

[298] U.S. Merger Guidelines, § 4.1.3.

[299] U.S. Merger Guidelines, § 4.1.3.

relevant markets. I cannot judge the truth or falsity of any documents or testimony. Rather, I evaluate the evidence available in this case to see whether explanations and observations from industry participants match the economic incentives that a dominant firm would have in the relevant product market. Where the qualitative evidence, on its face, is consistent with any quantitative analysis, I find that to be confirming evidence of the relevant markets.

123. Finally, the HMT can also evaluate competition from the supply side by accounting for the firms that reasonably could enter and compete in the relevant market if a hypothetical monopolist imposed a SSNIP. This concept is known as supply-side substitution. The *U.S. Merger Guidelines* note: "Firms that are not current producers in a relevant market, but that would very likely provide rapid supply responses with direct competitive impact in the event of a SSNIP, without incurring significant sunk costs, are also considered market participants."[300] If suppliers can easily switch production of similar products to the focal product (without significant costs or risks), that may provide a sufficient constraint on the firm in question to limit its market power. These effects can therefore be similar in terms of effectiveness and immediacy to the demand-side substitution effect.[301]

2. Market Definition and Two-Sided Markets

124. A two-sided market is, broadly speaking, "one in which 1) two sets of agents interact through an intermediary or platform, and 2) the decisions of each set of agents affects the outcomes of the other set of agents, typically through an externality."[302] In other words, consumer demand is interdependent, such that a consumer's value of a good increases with the number of other

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[300] *U.S. Merger Guidelines*, § 5.1. Similarly, the European Commission notes that: "Supply-side substitutability may also be taken into account when defining markets in those situations in which its effects are equivalent to those of demand substitution in terms of effectiveness and immediacy." *See* Commission Notice, ¶ 20.

[301] *See* Commission Notice, ¶ 20.

[302] Rysman (2009), p. 125.

consumers also purchasing that same good. This is known as a network effect.[303] The emphasis of the intermediary or platform is the main difference between the literature on two-sided markets and network effects. As I have noted previously in my research, the definitions are similar: "a good exhibits an indirect network effect if demand for the good depends on the provision of a complementary good, which in turn depends on demand for the original good."[304] Indeed, "the literature on two-sided markets could be seen as a subset of the literature on network effects," where "papers on two-sided markets tend to focus on the actions of the market intermediary, particularly pricing choices, whereas papers on network effects typically focus on adoption by users and optimal network size."[305]

125. Network effects arise indirectly (or virtually), when a higher number of users incentivizes innovation and development of complementary products, which then in turn increases the value to those purchasing the original good. The interdependence between agents on each side often creates a positive feedback loop in many markets where already strong firms get even stronger. One example is the market for Yellow Pages where "retailer demand for advertising increases in consumer usage and that consumer demand for directory usage increases in the amount of advertising."[306]

126. Other examples of two-sided markets with indirect network effects include shopping malls, where retailers derive value from the number of shoppers and shoppers benefit from the variety of retailers, and payment mechanisms such as credit cards where the attractiveness of a

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[303] *See*, *e.g.*, Shapiro, Carl, and Hal R. Varian, *Information rules: A strategic guide to the network economy*, Brighton, MA: *Harvard Business Review Press*, 1998, at p. 13; Katz, Michael L. and Carl Shapiro, "Network externalities, competition, and compatibility," *The American Economic Review*, Vol. 75, No. 3, 1985, pp. 424-440, available at https://www.jstor.org/stable/1814809, at p. 424; Rochet, Jean-Charles and Jean Tirole, "Two-sided markets: a progress report," *The RAND Journal of Economics*, Vol. 37, No. 3, 2006, pp. 645-667, available at https://www.jstor.org/stable/25046265.

[304] Rysman (2009), p. 127.

[305] Rysman (2009), p. 127.

[306] *See* Rysman, Marc, "Competition Between Networks: A Study of the Market for Yellow Pages," *The Review of Economic Studies*, Vol. 71, No. 2, April 2004, pp. 483–512, available at https://doi.org/10.1111/0034-6527.00512, at pp. 484 and 508.

payment mechanism to merchants and consumers is affected by how many consumers/merchants use/accept the card.

127. The pricing structure also plays an important role in two-sided markets in that the intermediary chooses the price charged to each side of the platform accounting for the benefit any given consumer will have on other users' valuation of the product. Specifically, intermediaries have an incentive to reduce prices for those consumers whose consumption of the good will increase the valuation of the good for other users. Doing so is efficient because it compensates those consumers for the positive externality they impose on other users, thereby increasing demand for the good.

128. However, as I have explained in my own research, "markets are not inherently two-sided or not,"[307] and "[t]wo-sidedness is not a binary outcome endowed by the market but is typically rather a choice made by firms about what ways to be two-sided."[308] It is therefore perhaps not surprising that the economics literature has identified multiple ways to consider two-sided markets.[309]

129. At the broadest level of generality, and as noted above, two-sided markets are those with "some kind of interdependence or externality between groups of agents that the intermediary serves."[310] In other words, in two-sided platforms, demand from both parties is inter-dependent – *i.e.*, demand from one party influences demand from the other (and possibly vice versa) "in a way that is not mediated through prices."[311] Moreover, "[t]his phenomenon leads to efficiencies as more market participants are able to interact with each other but also, in some circumstances, market power, as network effects can protect platform owners from entry."[312] The risk of network effects creating a barrier to entry for potential competitors—the chicken and egg problem, where entrants

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[307] Jullien, Pavan & Rysman (2022), p. 8.

[308] Jullien, Pavan & Rysman (2022), pp. 8-9.

[309] Rysman, Marc, "Exclusionary Practices in Two-Sided Markets," International Antitrust Law & Policy: Fordham Competition Law, 2012 (hereafter "Rysman (2012)"), at pp. 538-540.

[310] Rysman (2009), p. 126. *See also* Rysman (2012), pp. 538-540.

[311] Rysman (2012), p. 538.

[312] Jullien, Pavan & Rysman (2022), p. 4.

must attract users on both sides of the two-sided platform simultaneously—is particularly acute "[i]n markets with low marginal costs, as is the case for many digital markets."[313]

130. In addition, Hagiu & Wright (2015) note that two-sided platforms (or more generally, multi-sided platforms) have two distinct features, namely, enabling "direct interactions between two or more distinct sides" and affiliation with the platform by all relevant sides, beyond indirect network effects or non-neutrality of fees.[314] According to their definition, supermarkets and other old-fashioned retailers are "more like resellers than [multi-sided platforms] since they control the relevant decision variables like marketing activities, and prices."[315] Put differently, if the wholesaler, rather than the "retailer" intermediary, sets the price that the end-user pays, the market is likely two-sided.[316]

131. However, even applying these different economic principles, "virtually all markets might be two-sided to some extent."[317] Rather than classifying "firms with some binary distinction as being a platform or not," economists "should see the platform nature of a firm as a continuous dimension."[318] From the economist's perspective, "[t]he interesting question is often not whether a market can be defined as two-sided…but how important two-sided issues are in determining outcomes of interest."[319]

132. I have previously noted that "[m]arket definition has a clear analog in the two-sided market literature."[320] In terms of the analytical tools to apply to market definition, they must

[313] Jullien, Pavan & Rysman (2022), p. 4. *See also* Caillaud, Bernard and Bruno Jullien, "Chicken & egg: Competition among intermediation service providers," *RAND journal of Economics*, Vol. 34, No. 2, 2003, pp. 309-328, available at https://doi.org/10.2307/1593720 (hereafter "Caillaud & Jullien (2003)"), at pp. 309-310.

[314] Hagiu, Andrei and Julian Wright, "Multi-sided platforms," *International Journal of Industrial Organization,* Vol. 43, 2015, pp. 162-174, available at https://doi.org/10.1016/j.ijindorg.2015.03.003 (hereafter "Hagiu & Wright (2015)"), at p. 163.

[315] Hagiu & Wright (2015), p. 164.

[316] Rysman (2012), p. 539.

[317] Rysman (2009), p. 127 and Jullien, Pavan & Rysman (2022), p. 7 ("In reality, almost every real-world firm has some elements of two-sidedness to it").

[318] Jullien, Pavan & Rysman (2022), p. 7.

[319] Rysman (2009), p. 127.

[320] Rysman (2012), p. 548.

recognize that firms in two-sided markets can profit from both sides or from one side at the expense of the other (*i.e.*, pricing below incremental cost to one group and recouping from the other). Economists have argued that the SSNIP test can be performed on the platform so long as the test "account[s] for profits to the platform firm on both sides of the market."[321] As I have explained:

> In a two-sided market, we should keep in mind that when we raise the price on one side, the resulting reduction in quantity has implications for the other side—typically, it drives away agents on the other side and thus reduces profits. Thus, all else equal, the effect of considering a two-sided market is often to increase the size of the relevant market, since the price increases will be less attractive than they otherwise would be.[322]

133. Markets can move to a position where consumers single-home and migrate to one platform, while those wanting access to consumers multi-home across multiple platforms. This matters because the platforms in this context are monopolists over access to members that do not use other platforms (particularly if those consumers would not consider switching). In these cases, there is a sense in which platforms compete for consumers to use their platform, and then charge monopoly prices to the side of the market that is trying to reach those users.[323]

134. Filistrucchi et al. (2014), also considered whether the standard SSNIP test should be amended to account for indirect network effects, concluding that the SSNIP should be modified for two reasons:

> The first reason is that, in a two-sided market, the traditional SSNIP test cannot be applied as it is usually conceived. As already noted, market definition should account for both sides of the market in order to correctly assess the competitive constraints faced by firms. The logic of the SSNIP test should thus be extended (and therefore the formulas for CLA

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[321] Rysman (2012), p. 548. *See*, *e.g.*, Evans, David S., "Two-sided market definition," *ABA Section of Antitrust Law, Market Definition in Antitrust: Theory and Case Studies*, Forthcoming, April 29, 2009, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1396751, at p. 3 ("[O]ne common approach—using the price-cost margin on one side to assess critical loss tends—to understate the effects of a merger on prices compared with the two-sided market formula. Another approach—estimating demand elasticities directly based on a standard one-sided model—tends to overstate the effects of a merger on prices.").

[322] Rysman (2012), p. 548.

[323] Rysman (2009), p. 131. *See also* Armstrong, Mark, "Competition in two-sided markets," *The RAND Journal of Economics*, Vol. 37, No. 3, 2006, pp. 668-691, available at https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1756-2171.2006.tb00037.x.

> [Critical Loss Analysis][324]) in order to account for the indirect network effects between the two sides of the market when judging the profitability of a price increase.[325]
> The second reason why the test should be modified is that, if one wants to use a SSNIP test (or CLA) in a two-sided market, one should follow the original rationale of the test: defining the market as the smallest set of products on which a monopoly would find it profitable (or profit-maximizing) to exercise market power by non-temporarily raising the price above the current competitive level (at least) by a small but significant percentage.[326]

This view suggests that one should check the profitability of the sum total price paid by all parties when considering a two-sided market.[327]

B. Application of the Market Definition Framework to this Case

135. The market for an app distribution platform on a mobile OS relies on indirect network effects. First, mobile OSs intermediate between hardware devices (*e.g.*, smartphones and tablets) and software applications (*e.g.*, social media and games), thus requiring the adoption of hardware by consumers and the development of applications by software developers. Apps are an important part of the user experience, [redacted][328] These effects are indirect because a consumer

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[324] Note that "CLA" stands for critical loss analysis.

[325] *See* Filistrucchi, Lapo, Damien Geradin, Eric van Damme, and Pauline Affeldt, "Market definition in two-sided markets: Theory and practice," *Journal of Competition Law & Economics*, Vol. 10, No. 2, June 2014, pp. 293-339 (hereafter "Filistrucchi et al. (2014)"), at p. 330.

[326] *See* Filistrucchi et al. (2014), pp. 331.

[327] *See*, *e.g.*, Filistrucchi et al. (2014), p. 333.

[328] Brady (Google) Deposition, pp. 64-65 [redacted]

does not rely on other people owning the same device per se; the benefits come from the incentive for app developers to develop apps for a given OS ecosystem. In turn, the quality and quantity of apps available entice more consumers to use that OS.

136. Second, in terms of app distribution, as explained in Section IV.A.4 above, I understand that Google does not buy apps or in-app content from developers at a fixed price and quantity and then through Google Play Store re-sell an inventory of apps to end-users of Android smart mobile devices. Rather, at the app distribution stage, the developer makes a profit only from the purchase of apps by an end-user.[329] If no end-user buys the app, the developer makes nothing from having the app listed in Google Play. As discussed at paragraph 130 above, this structure suggests that Google operates the Play Store as a two-sided app distribution platform.

137. Finally, in terms of in-app billing, Google provides billing services directly to developers, who use billing services as an input to sell the in-app content product to users. There are no strong indirect network effects or interdependence between the sides of the market, and therefore I analyze in-app billing services as a traditional one-sided market, as explained further below in Section V.D.3.

138. I determine that there are two relevant antitrust markets, accounting for Google's product and potential substitutes at each level, which are relevant to evaluating Google's challenged conduct:

- The Android App Distribution Market, a two-sided market, which includes the dynamics between app distribution platform owners, developers choosing how to distribute their apps, and consumers choosing between different distribution methods; and
- The Android In-App Billing Market, focusing on developers choosing between competing in-app billing service providers. As mentioned above, I consider in-app billing services to be a one-sided market where developers are the customers of these services. The differences in my assessment of this market are explained further below.

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[329] This excludes the profit a developer may make from any in-app purchases or by any other means within the app (*e.g.*, advertising).

139. In the next section, I apply the principles of market definition set out in Section V.A to each of the candidate markets and conclude that each is a relevant market for evaluating the Google conduct claimed to be anticompetitive.

C. App Distribution on Android Smart Mobile Devices is a Relevant Market

1. Introduction

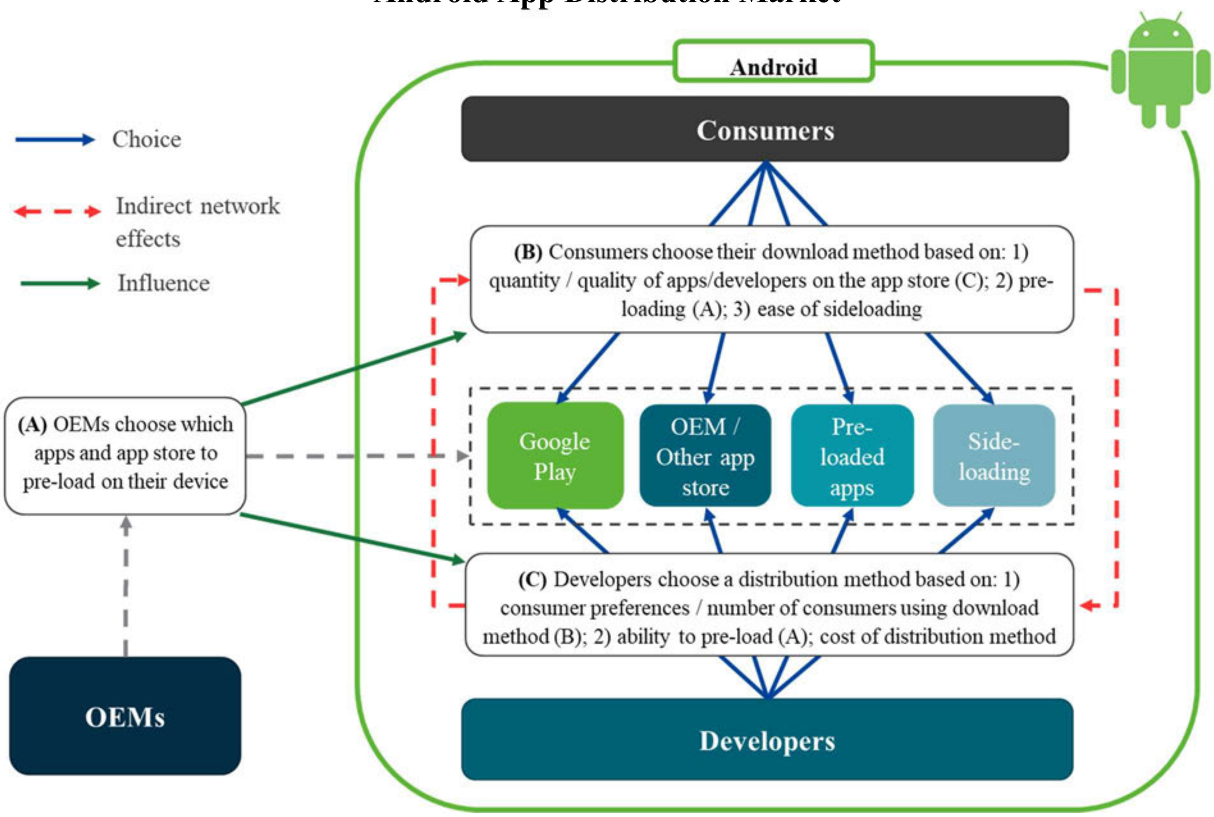
140. The first antitrust market pertinent to evaluating Google's challenged conduct is the worldwide (excluding China) Android App Distribution Market. After developing their apps for a particular mobile OS, app developers must decide how to distribute their apps to users of that mobile OS ecosystem. With respect to Android, absent Google's restrictions, this decision would be influenced by several factors, including the number of consumers using the various distribution methods (*i.e.*, the indirect network effects) – which directly influences the number of potential sales, the choices available in any tied markets such as in-app billing services, the cost of each distribution method (*i.e.,* the commissions or revenue sharing arrangements), and any ability to pre-load their apps. As noted in Section III.C.1, the Google Play Store is the leading app distribution platform on Android. However, absent Google's challenged conduct, alternative distribution methods, including OEM app stores (*e.g.*, the Samsung Galaxy Store), third-party app stores (*e.g.*, F-Droid), pre-installed apps, and sideloading, would likely be more viable alternatives for app developers to distribute their apps than in the actual world in which Google imposes the various anticompetitive restrictions described in Section IV.B.

141. From a consumer perspective, after choosing a smart mobile device with a pre-installed OS, consumers may then search for or obtain apps using different methods. The consumer's choice of where to obtain apps is influenced by whether they have a particular app in mind, the app store that was pre-installed on the mobile device (*i.e.*, the default app store and its placement on the home screen), any apps that were pre-installed on the device, the quantity and quality of app developers using the different app stores, and the ease with which apps can be sideloaded onto the device, among other factors.

142. For smart mobile device users who have opted into the Android ecosystem, the distribution methods include the various means through which they can access *Android* apps. The

Android App Distribution Market therefore comprises the following means by which Android apps may be distributed to Android mobile device users in a world absent Google's challenged conduct (as also set out in Section III.C): The Google Play Store; other app stores that are available for Android including, for example, the Samsung Galaxy Store (on Samsung devices), Amazon Appstore, and F-Droid; OEMs pre-installing their own apps or apps from third-party developers on their Android smart mobile devices; and sideloading, such as downloading directly from a developer's web page using a mobile browser or peer-to-peer transfer between two smart mobile devices via a wireless connection (*e.g.*, Bluetooth or Wi-Fi) or physical connection (*e.g.*, USB or memory cards). Exhibit 18 provides a depiction of the various distribution channels included in the two-side Android App Distribution Market and the consumer, developer, and OEM choices in this market.

Exhibit 18
Android App Distribution Market



143. As explained further below, distribution methods for accessing non-Android non-mobile apps, such as the Apple App Store, app stores on PCs or gaming consoles, or using apps in a

web browser ("web-based apps"), do not compete with these Android app distribution methods. Due to technical barriers (*i.e.*, incompatibility with Android smart mobile devices) and the different use cases for these other devices, these app stores are not credible substitutes for the Google Play Store or any other Android app distribution method.[330] Therefore, I find that a relevant app distribution market is limited to the Android App Distribution Market.

144. In the remainder of this section, I describe in more detail the relevant constraints on the Google Play Store from both the consumer and developer perspectives, whether other alternatives for mobile app distribution such as the Apple App Store and PC/console app stores form part of the relevant market, and the relevant geographic market for Android App Distribution. In summary, my conclusions on the relevant market and Google's market power would be the same regardless of this particular characterization, so the particular type of two-sided market does not affect my overall conclusions in this case.

2. *Consumer Choice of App Distribution Method*

145. OEMs pre-install certain apps on Android smart mobile devices (either for their own purposes or via agreements with third parties). If users want to install additional apps on their devices, they must download them via an app store or sideloading. Before users can download apps from a specific app store, they must first access the app store itself. Typically, OEMs pre-install at least one app store on Android smart mobile devices (and, in most instances for reasons explained below, it is the Google Play Store).[331] [redacted]

[330] "On Apple devices, apps are typically written in Swift or Objective-C; thus, iOS provides middleware libraries for use by Swift apps and Objective-C apps. A consequence is that iPhone apps written in Swift or Objective-C will generally not run on Android phones due to (among other things) the absence of the middleware required by those apps. For similar reasons, Android apps written in Java are generally unable to run on iPhones. So, app distribution channels on iPhones cannot be trivially 'transplanted' to Android phones, nor can app distribution channels on Android be trivially used on iPhones." See Mickens Report, ¶79.

[331] EC Google Android Decision, ¶ 596 and Table 4.

[redacted][333]

146. As noted in Section IV.B, [redacted][334] [redacted][335] Thus, "flagship devices from Samsung, LG, HTC and Motorola all come with the Google Play store preinstalled."[336] [redacted]

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[332] Rosenberg (Google) Deposition, p. 23 [redacted] Email from Tim Carter, Google, to John Lagerling, former Senior Director of Android Global Partnerships for Google, [redacted] November 1, 2010, GOOG-PLAY-001404176-180, at 176 [redacted] Google, "Android Work," GOOG-PLAY-000042588.R-622.R, at 600.R [redacted] Google, "Play 2018 Planning Summit," 2018, GOOG-PLAY-000292207.R-230.R, at 226.R [redacted]; and CMA Final Report on Mobile Ecosystems, ¶¶ 4.108-4.121 and FN 268.

[333] *See* Email from Ben Serridge, Google, to Jonathan Zepp, Google, [redacted] March 6, 2013, GOOG-PLAY-006355073-074, at 073.

[334] [redacted] June 1, 2014, GOOG-PLAY-000449883-897, at 885.

[335] *See* [redacted] January 1, 2011, GOOG-PLAY-001471037-050, at 041 and [redacted] January 1, 2018, GOOG-PLAY4-005406595-618, at 600. *See also* Kolotouros (Google) Deposition, pp. 452-453 [redacted]

[336] Graziano, Dan, "How to download and install the Google Play store on any Android device," *CNET*, October 16, 2015, available at https://www.cnet.com/tech/mobile/how-to-download-and-install-the-google-play-store-on-any-android-device/.

[redacted][337] According to OEMs like LG and Huawei, the Google Play Store is "the main pre-installed" app store and "any other app store does not have more contents."[338] Some OEMs, like Samsung, pre-install their own app store (the Galaxy Store) in addition to the Google Play Store.[339] However, Google is concerned about [redacted].[340] As shown in Section VI.A.3, Google has succeeded in limiting competition from these alternative Android app stores.

147. As noted above, while OEMs can choose not to pre-install the Google Play Store, doing so prevents the OEM from offering any of the GMS apps or utilizing Google's APIs.[341] Amazon, for example, does not pre-install the Google Play Store on its tablets (which run on an Android fork called Fire OS) and instead pre-installs its own app store called Amazon Appstore.[342] As a consequence, on Amazon tablets, certain "third-party apps might not work properly or outright refuse to open in some cases… because apps heavily rely on the device's GMS backbone[;]" such

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[337] Google, [redacted] GOOG-PLAY-000218781.R-862.R, at 801.R.

[338] EC Google Android Decision, ¶ 277.

[339] According to Samsung, the Galaxy Store "could be a viable substitute" to the Google Play Store "[i]n terms of features and functionalities"). *See* EC Google Android Decision, ¶ 276.

[340] *See* Google, "[redacted]," June 20, 2019, GOOG-PLAY4-004259430-432, at 430 and Rosenberg (Google) Deposition, p. 74 [redacted]

[341] As noted in the CMA Final Report on Mobile Ecosystems, Appendix E ¶ 6: "Google Play Services APIs may allow third-party developers to make use of basic features and functionalities such as push notifications or to communicate with Google's first-party services (such as Google Maps, Search, Gmail, and Translate on Android) and create rich features compatible with Android.").

[342] *See* Davenport, Corbin, "The ultimate guide for installing the Google Play Store on Amazon Fire tablets," *Android Police*, August 11, 2022, available at https://www.androidpolice.com/install-play-store-amazon-fire-tablet/.

problems arise for example with apps that rely on Google Maps (including, *e.g.*, Uber or Lyft) or require users to log-in with a Google account.[343]

148. Consumers can use alternative app stores other than those already pre-installed on their Android smart mobile device. An alternative app store is itself an app. Because the Google Play Store does not make any alternative app stores available for download,[344] to use an alternative app store, consumers must first sideload the alternative app store onto their smart mobile devices, typically by downloading the app store directly from the app store developer's website (and, in doing so, receive the warning messages described in Section III.C.2 above).[345] According to Google's internal documents, [redacted][346]

149. Not all Android app stores function on every Android mobile device. For example, while the Google Play Store is available on almost every Android mobile device (as shown in Exhibit 40),[347] the Samsung Galaxy Store functions only on Samsung smart mobile devices.[348] Consumers' ability to switch or multi-home between Android app stores is thus limited to those alternative app stores that are functional on the consumers' specific Android mobile device.

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[343] *See* Wankhede, Calvin, "What are Google Mobile Services (GMS)?," *Android Authority*, March 3, 2022, available at https://www.androidauthority.com/google-mobile-services-gms-3025963/. *See also* Google, [redacted] August 2020, GOOG-PLAY-000093636.R-673.R, at 647.R, which states that [redacted]

[344] *See* Hindy, Joe, "10 best third party app stores for Android and other options too," *Android Authority*, June 30, 2022, available at https://www.androidauthority.com/best-app-stores-936652/.

[345] For example, Amazon Appstore and Aptoide are available for download on their developer's website. *See* Hindy, Joe, "10 best third party app stores for Android and other options too," *Android Authority*, June 30, 2022, available at https://www.androidauthority.com/best-app-stores-936652/; Amazon, "Amazon Appstore App For Android," available at https://www.amazon.com/gp/mas/get/android/; and Aptoide, "Aptoide," available at https://en.aptoide.com/.

[346] *See* Google, "App Stores on Android 12," February 2021, GOOG-PLAY-006814475.R-497.R, at 477.R [redacted]

[347] *See* Broida, Rick, "How to install Amazon Appstore on your Android device," *CNET*, June 25, 2015, available at https://www.cnet.com/tech/services-and-software/how-to-install-amazon-appstore-on-your-android-device/.

[348] *See* Mehvish, "What's the Difference Between Galaxy Store and Play Store," *Techwiser*, August 9, 2021, available at https://techwiser.com/difference-between-galaxy-store-play-store/.

150. Moreover, as discussed in Section III.A.3, alternative Android app stores are currently a limited substitute for the Google Play Store because they have limited numbers of apps relative to the Google Play Store. For example, the Amazon Appstore offered fewer than 500,000 apps in the first quarter of 2021, compared to over 3.5 million apps on the Google Play Store.[349]

151. Further, while Android users can, in theory, forego app stores altogether by sideloading apps directly onto their device,[350] the viability of sideloading as an alternative to the Google Play Store is currently limited by the fact that it requires users to change the security settings on their Android smart mobile devices to permit installations from "Unknown sources" and proceed through multiple steps containing warning messages.[351] In internal documents, [redacted][352] [redacted][353] Indeed, in another document, [redacted]

[349] *See* Ceci, L., "Number of apps available in leading app stores as of 2nd quarter 2022," *Statista*, August 11, 2022, available at https://www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/.

[350] In contrast, Apple does not allow users to sideload apps on iOS devices to "prevent third party applications or software from being downloaded to the phone." The only way for iOS users to get around Apple's restriction is to "jailbreak" their device. However, jailbreaking is "technically difficult" and constitutes "a violation of the iOS end-user software license agreements" under which Apple "may deny service for an iPhone or iPad that has installed any unauthorised software via jailbreaking." *See* CMA Final Report on Mobile Ecosystems, ¶¶ 4.101-4.103 and FN 293.

[351] [redacted] *See* Rosenberg (Google) Deposition, pp. 295-297; Samat (Google) Deposition, pp. 178-185; and Rubin (formerly Google) Deposition, pp. 300-301 ([redacted]). *See also* Hoff, John, "How To: Sideloading Apps on Your Android Device," *Android Community,* April 17, 2018, available at https://androidcommunity.com/how-to-sideloading-apps-on-your-android-device-20180417/; and EC Google Android Decision, ¶¶ 276-277.

[352] Google, "[redacted]" November 2015, GOOG-PLAY-000297309.R-329.R, at 310.R-314.R and Google, [redacted] February 2019, GOOG-PLAY-002011285.R-290.R, at 288.R.

[353] Google, [redacted] November 2015, GOOG-PLAY-000297309.R-329.R, at 310.R-314.R and Google, [redacted] February 2019, GOOG-PLAY-002011285.R-290.R, at 288.R.

[redacted][354] [redacted][355]

152. Given these limitations of alternative app stores and sideloading imposed by Google's challenged restrictions, it is unsurprising that the number of apps installed via these methods is small. [redacted][356] This low level of sideloading is supported by the following additional sources:

- According to Google data gathered by the CMA, in May 2021, only 3.5 – 4 million app downloads occurred via app stores that were not pre-installed by the OEM or via sideloading, compared to an average of 100 – 200 million app downloads per month via the Google Play Store in 2021.[357]
- [redacted][358]

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[354] Google, "[redacted] GOOG-PLAY-000415076-078, at 076. *See also* Google, [redacted] March 24, 2020, GOOG-PLAY-004904016.R-118.R, at 038.R [redacted] *See* Presser Report, p. 9.

[355] *See, e.g.*, Google, [redacted] December 2019, GOOG-PLAY-004662365.R-402.R, at 367.R and 396.R. This is also consistent with the CMA's finding that "only a small proportion of downloads on Android devices are via sideloading." *See* CMA Final Report on Mobile Ecosystems, ¶¶ 4.108-4.112 and FN 297. [redacted] GOOG-PLAY-000806246.

[356] *See* Google, "Apps by Source," GOOG-PLAY-001508603 and Rysman Workpapers. [redacted] See footnote 78 for further detail on document GOOG-PLAY-001508603.

[357] *See* CMA Final Report on Mobile Ecosystems, ¶¶ 4.108-4.112 and FN 268.

[358] *See, e.g.*, Google, [redacted] December 2019, GOOG-PLAY-004662365.R-402.R, at 367.R and 396.R.

- [redacted][359]
- [redacted][360]

153. Despite the evidence of minimal consumer use of alternative Android app stores under current market conditions, there are no significant costs to downloading an alternative Android app store besides the unknown sources warning. Thus, in a world absent Google's challenged restrictions, consumers could choose alternative Android app distribution methods (such as a rival app store or sideloading an app directly from the developer), especially if alternative Android distribution methods were competitive on the quality and quantity of apps available.

3. Developer Choice of App Distribution Method

154. As noted above, after making the initial decision to develop their apps for the Android OS, developers then choose the method to distribute these apps to Android users, whether via an Android app store and/or via sideloading. [redacted][361]

[359] *See* Google, [redacted] October 7, 2016, GOOG-PLAY-000042623.R-639.R, at 632.R. [redacted] GOOG-PLAY-000571537.

[360] Email from James Bender, Google, to Paul Bankhead, Chief Product Officer of MasterClass for Google, and Aaron Rothman, Google, [redacted] July 25, 2018, GOOG-PLAY-001254353-355, at 354.

[361] "Defendants Google LLC, Google Ireland Limited, Google Commerce Ltd., Google Asia Pacific Pte. Ltd. and Google Payment Corp.'s Responses and Objections to Epic's Second Set of Interrogatories to Defendants," *Epic Games Inc.* v. *Google LLC et al.*, Case No. 3:20-cv-05671-JD, July 19, 2021, at p. 10.

155. [redacted][362] [redacted][363] as shown in Exhibit 19.

Exhibit 19

[redacted]

Source: Google, [redacted] February 2019, GOOG-PLAY4-004258208-234 at 216.

156. Because different consumers may use different Android smart mobile devices with different pre-installed app stores or have a preference for certain distribution methods (*e.g.*, a third-party app store or sideloading), developers can ensure that their apps are available to a larger

[362] Google, [redacted] February 2018, GOOG-PLAY-000005203.R-312.R, at 207.R.
[363] Google, [redacted] February 2019, GOOG-PLAY4-004258208-234, at 215-216.

number of consumers by publishing their apps on multiple distribution channels within the Android App Distribution Market. As described in Section III.B, some app developers tend to multi-home by publishing apps across different app stores. [redacted][364] Nonetheless, the number of apps published on the Google Play Store vastly outnumbers the number of apps offered on any other Android app store.[365]

157. [redacted][369]

158. Nonetheless, I find that technical barriers and financial requirements would not inhibit developers from multihoming. While there are some technical barriers to making Android apps available on different distribution channels, the "similarities in the source code between different Android OSs" means it is relatively easy for developers to modify an app to ensure its

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[364] *See* Google, [redacted] February 2018, GOOG-PLAY-000565850-956, at 905.

[365] As of 2nd quarter of 2022, there are about 3.5 million apps available on the Google Play Store, whereas approximately 48,000 apps are available on the Amazon Appstore. *See, e.g.*, Ceci, L., "Number of apps available in leading app stores as of 2nd quarter 2022," August 11, 2022, available at https://www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/.

[366] Koh (EA (formerly Google)) Deposition, pp. 89-90.

[367] Koh (EA (formerly Google)) Deposition, pp. 321-324.

[368] Koh (EA (formerly Google)) Deposition, p. 322.

[369] Koh (EA (formerly Google)) Deposition, pp. 50-51 and 101-102.

functionality on various Android smart mobile devices.[370] While developers may also need to pay a fee for every additional app store on which they publish their app, such one-time fees are modest or even free. For example, the Google Play Store charges a one-time developer fee of USD $25, while the Samsung Galaxy Store is free of charge for developers.[371]

159. Therefore, I find that, in the world absent Google's challenged restrictions, developers would be more incentivized to distribute their apps via alternative distribution methods that offer them a higher share of the revenues on app sales and in-app purchases and to multi-home across several distribution methods. Finally, given the likelihood that consumers use multiple distribution channels, developers would have a further incentive to actively promote the distribution of their apps via alternative platforms (or via sideloading), for example by offering lower prices for their apps or its in-app content to their consumers. [redacted][372]

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[370] *See* EC Google Android Decision, ¶ 282.

[371] *See* Team Isrg KB, "How to upload Android app or Game on Samsung Galaxy Store?" *ISRG KB*, available at https://www.isrgrajan.com/how-to-upload-android-app-or-game-on-samsung-galaxy-store html.

[372] Google, [redacted] February 2018, GOOG-PLAY-000005203.R-312.R, at 256.R.

Exhibit 20

[redacted]

Source: Google, [redacted] February 2018, GOOG-PLAY-000005203.R-312.R at 256.R.

4. *App Distribution on Alternative Devices does not Constrain App Distribution on Android Smart Mobile Devices*

a) Role of switching costs in defining the relevant markets

160. Before discussing the alternative markets, it is worth highlighting the importance of switching costs when assessing the boundaries of the relevant market. As noted in the economics literature, switching costs often create high barriers to entry that lock in consumers to a series of future purchases based on an initial purchase, thereby granting an incumbent firm substantial market power and raising concerns about competition and innovation:[373]

> Large switching costs lock in a buyer once [the buyer] makes an initial purchase, so [the buyer] is effectively buying a series of goods.

[373] *See* Farrell, Joseph, and Paul Klemperer, "Coordination and lock-in: Competition with switching costs and network effects," *Handbook of Industrial Organization*, Vol. 3, 2007, pp. 1967-2072, available at https://doi.org/10.1016/S1573-448X(06)03031-7, at pp. 1970 and 1972.

> Lock-in hinders customers from changing suppliers in response to (predictable or unpredictable) changes in efficiency, and gives vendors lucrative ex post market power – over the same buyer in the case of switching costs (or brand loyalty), or over others with network effects.

161. Switching costs can include compatibility costs (*e.g.*, purchasing complementary products or services from the same supplier), transaction costs (*e.g.*, migrating data and personalized information from one device to another), learning costs (*e.g.*, learning how to use the devices or software of a new supplier), uncertainty costs (*e.g.*, uncertainty about the quality of new products or services), and contractual costs (*e.g.*, discounts on repeat purchases), among others.[374]

162. Switching costs typify and define these markets. When consumers purchase a mobile device, they consider various features of different devices, including price, screen quality, battery life, camera, design, storage, and the pre-installed mobile OS (which could be licensable, like Android, or proprietary, like iOS).[375] This *initial* purchase is therefore also the gateway into the mobile OS ecosystem associated with that mobile device.[376] However, penetration of smartphone usage has increased rapidly over time, and thus, the number of consumers faced with that initial purchase decision is quite low, particularly in the U.S. and other developed countries. For example, in 2014, 67.6% of mobile phone users in the U.S. owned smartphones; by 2020, that figure was forecast to increase to more than 87%.[377] Among those aged 12 to 64, smartphone penetration ranged from 59% to 85% in 2014 and was forecast to range from approximately 93% to more than

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[374] *See* Klemperer, Paul, "Competition when consumers have switching costs: An overview with applications to industrial organization, macroeconomics, and international trade," *The Review of Economic Studies,* Vol. 62, No. 4, 1995, pp. 515-539, available at https://doi.org/10.2307/2298075, at pp. 517-518.

[375] Smartphone purchasers may also be influenced by the brand and OS of the phones purchased by their friends. *See* Bailey, Michael, Drew M. Johnston, Theresa Kuchler, Johannes Stroebel, and Arlene Wong, "Peer Effects in Product Adoption," *American Economic Journal: Applied Economics*, July 2022, Vol. 14, No. 3, pp. 488-526, available at https://www.aeaweb.org/articles?id=10.1257/app.20200367, at p. 488.

[376] Lockheimer (Google) Deposition, pp. 430-431 [redacted].

[377] Liu, Cindy, "US Digital Users: The eMarketer Forecast for 2016," *eMarketer*, February 2016, available at http://static1.squarespace.com/static/51b949f4e4b0c43b09f8b97f/t/57030153b6aa607cbb9a4ff9/1459814747214/eMarketer_US_Digital_Users-The_eMarketer_Forecast_for_2016.pdf (hereafter "Liu (2016)"), at p. 5.

99% in 2020.[378] [redacted][379] [redacted][380] [redacted][381]

163. [redacted][382] particularly between Google Android OS and Apple iOS.

b) There are many reasons why consumers do not switch mobile OSs

(1) The Android and iOS ecosystems are incompatible

164. Android and iOS are highly differentiated OSs that are integrated into two separate ecosystems with incompatible software and hardware. Switching smart mobile devices from Android to iOS means moving away from the whole mobile OS ecosystem, with users losing benefits of network externalities enjoyed by other users of platform-exclusive apps.

165. Moreover, as discussed in Section III.B, apps written for one mobile OS are incompatible with a different mobile OS. Thus, consumers cannot buy apps on Android smart mobile devices and then use those apps on an iOS device, and vice versa. There is no way for the consumer to download an app from an Android smart mobile device and then upload it to an iOS device; rather, when switching to iOS, the user would need to re-download the app on their iOS

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[378] Liu (2016), at p. 24.

[379] Google, "[redacted] GOOG-PLAY-004530552-567, at 555.

[380] Google, [redacted] March 19, 2019, GOOG-PLAY4-004915563-582, at 574.

[381] [redacted] April 2019, GOOG-PLAY-002409453.R-534.R, at 459.R-461.R.

[382] [redacted] GOOG-PLAY-011119640-686, at 647.

device. Even if a consumer could upload an Android app to an iOS device, the code, designed for Android, would be non-functional on iOS; it could not be installed or operate without modifications to make the app interoperable with iOS. Thus, the choice of iOS as an alternative app distribution channel for consumers would involve the consumer abandoning Android apps in favor of iOS apps and purchasing an Apple device to do so.

(2) Users customize their smart mobile devices and accumulate learning in a certain mobile OS ecosystem

166. Users who stay in a mobile OS and its ecosystem long enough usually customize their devices (*e.g.*, Android phones offer more customization options on home screen and widgets[383]) and also become accustomed to it and accumulate learning about it. [redacted][384] [redacted][385]

167. [redacted][386] In particular, Android users switching to an iPhone for the first time will have to go through a series of changes such as setting up an Apple ID, getting familiar with Siri, and using AirDrop instead of Bluetooth to transfer files.[387]

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[383] Davidson, Jamie, "Is Android More Customizable Than iOS?" PC-Tablet, January 17, 2022, available at https://pc-tablet.com/is-android-more-customizable-than-ios/.

[384] *See*, *e.g.*, Google, "[redacted] January 18, 2017, GOOG-PLAY-000880576.R-645.R, at 589.R.

[385] Lockheimer (Google) Deposition, pp. 430-431 [redacted] *See also* Google, "iOS Switchers," August 2018, GOOG-PLAY-000096813.R-844.R, at 817.R [redacted]

[386] *See*, *e.g.*, Google[redacted] January 18, 2017, GOOG-PLAY-000880576.R-645.R, at 589.R. *See also* Google, "Partnering with Google," GOOG-PLAY4-007931487-501, at 496 [redacted].

[387] *See*, *e.g.*, Mehak, "15 insanely handy tips for first-time iPhone users," *iGEEKSBLOG,* May 23, 2022, available at https://www.igeeksblog.com/handy-tips-for-first-time-iphone-users/.

168. I understand that in April 2022, Google launched the "Switch to Android" app, which is available for download on the Apple App Store and designed to facilitate user switching from an iOS to an Android smart mobile device. Even that attempt to facilitate switching with the use of an app has not solved all the data loss concerns that consumers have. For example, as Google instructs the public, iMessage and Facetime must be turned off before completing the switching process to ensure no loss of data.[388] Hiroshi Lockheimer, Senior Vice President responsible for Android at Google, testified that [redacted][389] [redacted][390]

(3) Certain content cannot be used on another mobile OS

169. [redacted][391] [redacted][392] For example, the Presser Report found that 62% of respondents would worry "[i]f [they] switched to an iPhone," they "might lose access to photos, phonebooks, or other things [they] now have on [their] phone."[393]

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[388] Perez, Sarah, "Google's 'Switch to Android' app now officially rolling out," *Tech Crunch*, April 19, 2022, available at https://techcrunch.com/2022/04/19/googles-switch-to-android-app-now-officially-rolling-out/ and Android, "Move your stuff from iOS," available at https://www.android.com/switch/.

[389] Lockheimer (Google) Deposition, pp. 443-444.

[390] AT&T, [redacted] January 2, 2018, ATT-GPLAY-00005216-220, at 217.

[391] Google, [redacted] GOOG-PLAY-000437878.R-908.R, at 890.R [redacted].

[392] *See*, *e.g.*, Google, [redacted] January 18, 2017, GOOG-PLAY-000880576.R-645.R, at 607.R.

[393] Presser Report, p. 8.

(4) Users who switch may have to pay again for apps and content in the new ecosystem[394]

170. [redacted][395] Thus, switching costs increase with a user's desire to replicate on the new device investments in apps and in-app purchases. [redacted][396] In other words, the more devices (*e.g.*, smartphones, tablets, smart home accessories, etc.) a user has in one environment, the higher the cost of switching smartphones (or any one particular device) away from that ecosystem.

(5) Smartphones are expensive, and carriers and device manufacturers use contracts and promotions to lock in consumers

171. Buying a new smart phone costs a lot of money, typically hundreds of dollars. For example, data from IDC shows that for smartphones sold in 2021 worldwide excluding China, an Android phone cost $239 on average while an iPhone cost $967 on average, as depicted in Exhibit 21 below.

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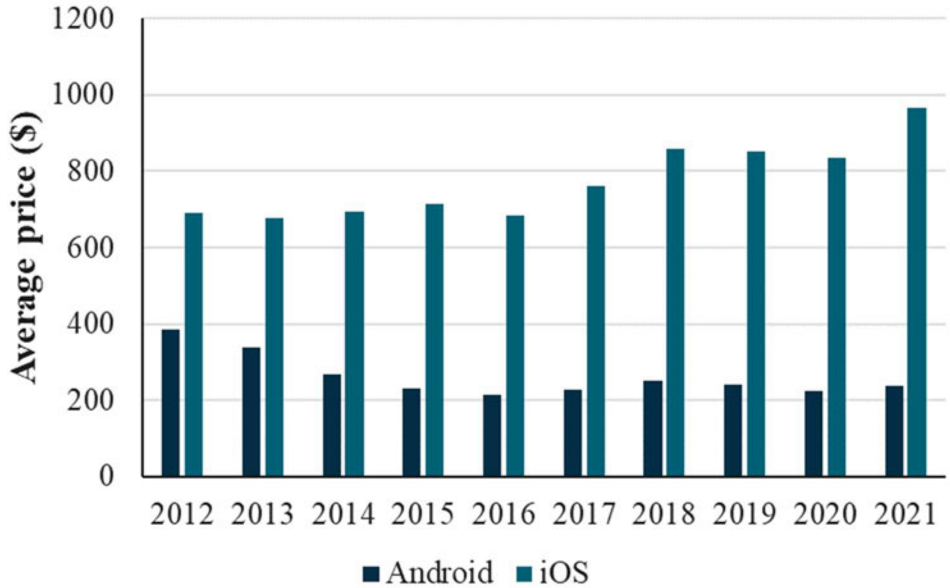
[394] *See*, *e.g.*, Huang, Michelle, "Here's why it's so hard to switch from Apple to Android," *Business Insider Australia,* June 10, 2019, available at https://www.businessinsider.com/apple-to-android-switch-new-phone-stuck-ecosystem-2019-6?r=US&IR=T.

[395] *See* Google, [redacted] GOOG-PLAY-001043637.R-714.R, at 696.R [redacted] Even if an app is cross-platform and users can access their account from either OS, it may be that their password and biometric security information is stored on their current device, so switching devices may create a barrier to access accessing some apps. *See also* Raphael, JR, "iPhone to Android: the ultimate switching guide," *Computer World,* February 7, 2020, available at https://www.computerworld.com/article/3218067/how-to-switch-from-iphone-to-android-ultimate-guide.html; and "Defendant's Responses and Objections to State Plaintiffs' Second Set of Requests for Admission," *Epic Games Inc.* v. *Google LLC et al.*, United States District Court Northern District of California San Francisco Division, Case No. 3:21-md-02981-JD, August 22, 2022, at p. 13 [redacted]

[396] *See*, *e.g.*, Google, "[redacted] September 2020, GOOG-DOJ-19768791-817, at 792.

Exhibit 21
Average smartphone prices by OS, Worldwide (excluding China), 2012 – 2021



Note: The average smartphone price is calculated as the total value divided by the total units for each OS in each year.
Source: IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.

172. Consumers must either pay this device cost up front or over time pursuant to an installment plan tied to a wireless contract. More than 50% of U.S. mobile smartphone users are on carriers' installment contracts that are usually up to 12 or 24 months long.[397] In addition, consumers may obtain benefits (such as trade-in discounts on new devices) by signing service contracts of

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[397] *See*, *e.g.*, Kunst, Alexander, "What type of contract length is your cellphone contract?" *Statista*, December 20, 2019, available at https://www.statista.com/statistics/718517/length-of-a-mobile-phone-contract-in-the-us/; and Kunst, Alexander, "Did you get your smartphone as part of a cellphone contact?" *Statista*, December 20, 2019, available at https://www.statista.com/statistics/716111/contract-bundled-smartphone-ownership-in-us/. Additionally, smartphone users are waiting longer to upgrade devices, thereby reducing the percent of smartphone users considering an upgrade at any given time. *See*, *e.g.*, Ng, Abigail, "Smartphone users are waiting longer before upgrading – here's why," *CNBC*, May 17, 2019, available at https://www.cnbc.com/2019/05/17/smartphone-users-are-waiting-longer-before-upgrading-heres-why html ("In the U.S. and Europe, especially, the life cycle of a smartphone has been steadily increasing, according to data from market research firm Kantar Worldpanel.") and Lockheimer (Google) Deposition, pp. 429 [redacted]

varying length.[398] Carrier contracts may include penalties for early termination (*e.g.,* loss of trade-in discounts), which reduce consumers' willingness to change devices within a contract term.[399]

(6) The average Android user spends less on technology

173. Other factors such as consumers' spending behavior for smart mobile devices and related content may also affect their switching decisions. Android users, on average, tend to spend less on smart mobile devices and related content than iOS users. Android phones have a wide variety of models from low budget to high-end, with prices for Android phones ranging from $156 for a Motorola Moto G Pure to $1599 for a Samsung Galaxy Z Fold3 5G.[400] While iPhone comes in less expensive models, like the iPhone SE which retails from $429, Apple mainly targets the premium smartphone market (*e.g.*, iPhone 14 models range from $799 to $1199 and iPhone 14 Pro models range from $999 to $1599).[401] iPhone users and Android phone users also differ in spending, with iPhone users spending an average of $50 more per month on tech purchases than Android users (monthly average of $101 on tech purchases for iPhone users versus $51 for Android users).[402]

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[398] See, e.g., Verizon, "Device Trade-in Program Terms & Conditions," available at https://www.verizon.com/support/device-trade-in-program-legal/.

[399] Verizon, "Cancel your service," available at https://www.verizon.com/support/residential/account/manage-service/cancel.

[400] *See*, *e.g.*, Triggs, Robert, "Did smartphones get a lot more expensive in 2020? Let's look at the numbers," *Android Authority,* December 19, 2020, available at https://www.androidauthority.com/smartphone-price-1175943/. *See also* Johnson, Allison, Gloria Sin, and Dieter Bohn, "The Best Smartphone You Can Buy for under $500," *The Verge*, August 8, 2022, available at https://www.theverge.com/21420196/best-budget-smartphone-cheap. *See also* Samsung, "Galaxy Z Fold3," available at https://www.samsung.com/us/smartphones/galaxy-z-fold3-5g/buy/ and T-Mobile, "Motorola Moto G Pure," available at https://www.t-mobile.com/cell-phone/motorola-moto-g-pure.

[401] *See*, *e.g*, Apple, "Buy Iphone SE," available at https://www.apple.com/shop/buy-iphone/iphone-se; Apple, "Buy Iphone 14," available at https://www.apple.com/shop/buy-iphone/iphone-14; and Apple, "Buy Iphone 14 Pro," available at https://www.apple.com/shop/buy-iphone/iphone-14-pro. *See also* Silver, Stephen, "Apple Leads in Premium Smartphone Market Share," *The National Interest*, June 25, 2022, available at https://nationalinterest.org/blog/buzz/apple-leads-premium-smartphone-market-share-203210.

[402] *See*, *e.g.*, Comscore, "iPhone Users Earn Higher Income, Engage More on Apps than Android Users," August 14, 2014, available at https://www.comscore.com/ita/Public-Relations/Infographics/iPhone-Users-Earn-Higher-Income-Engage-More-on-Apps-than-Android-Users. *See also* PR Newswire, "iPhone Users Spend $101 Every Month on Tech Purchases, Nearly Double of Android Users, According to a Survey Conducted by Slickdeals," October 30, 2018, available at https://www.prnewswire.com/news-releases/iphone-users-spend-101-every-month-on-tech-purchases-nearly-double-of-android-users-according-to-a-survey-conducted-by-slickdeals-300739582.html?c=n.

(7) Multiple ecosystem purchases enhance ecosystem lock-in

174. [redacted][403] For example, the CMA Consumer Survey found 52% of Android smartphone users own at least one other Android/Google product, with 36% owning an Android tablet, and 24% having Google Smart Home devices.[404] Consequently, firms may increase prices to consumers who are locked into their current mobile OS ecosystem, which consumers could not have accounted for when opting into that ecosystem.[405]

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175. Importantly, these switching costs operate together. Some may be more or less important for particular users, but the net effect is to significantly insulate economic decisions purely within one ecosystem—such as, for example, the terms and conditions of app distribution within Android or iOS—from the effect of competition by the other ecosystem and its devices. For the purposes of evaluating the relevant market for Android App Distribution, it does not matter which of these reasons explains the lack of switching; rather, the lack of switching still means that consumers will not switch in response to a price change in Android App Distribution, which delineates the relevant market for Android App Distribution.

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[403] Lockheimer (Google) Deposition, pp. 435-436 ([redacted].

[404] *See* Accent, "Consumer purchasing behaviour in the UK smartphone market," June 2022, pp. 33-34, available at https://assets.publishing.service.gov.uk/media/62a1cb0b8fa8f50395c0a0e7/Consumer_purchasing_behaviour_in_the_UK_smartphone_market_-_CMA_research_report__1_.pdf (hereafter "CMA Consumer Survey").

[405] See Shy, Oz, *The Economics of Network Industries*, Illustrated Edition, Cambridge, UK: Cambridge University Press, 2001, p. 5 ("[I]f consumers are already locked-in using a specific product, firms may raise prices knowing that consumers will not switch unless the price difference exceeds the switching cost to a competing brand.").

c) Other economic evidence of switching costs

176. More general economic evidence also confirms the importance of switching costs in users' decisions to change smart mobile devices. Park and Koo (2016), a study on South Korean smartphone users, estimated that users' costs for switching mobile OS is about 202.7 thousand Korean won (c. $189 in 2014).[406] Park and Koo also explain that when users replace their old smartphones, they tend to choose the same mobile OS. This is because switching costs increase with factors such as the uncertainty about the compatibility of previously purchased applications and uncertainty about the possibility of additional payments after switching. Another study, using a discrete choice model, estimated the willingness to pay for switching OS for users in a European country to be €520 ($510[407]).[408] These costs are very high relative to the cost of most apps or in-app content.

177. [redacted][409] Such uncertainties are compounded by the changes in smart mobile device features over time as well as consumers' changing preferences or how they value certain features and functionalities over others, which makes it even more difficult to predict the lifecycle price when a consumer buys a smart mobile device.[410] This is another reason that the terms and conditions of belonging to one ecosystem or another (such as inflated app prices caused by a lack of competition to distribute apps) will not tend to be disciplined by the behavior of the other ecosystem.

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[406] *See*, Park, Yuri, and Yoonmo Koo, "An empirical analysis of switching cost in the smartphone market in South Korea," *Telecommunications Policy*, Vol. 40, No. 4, 2016, pp. 307-318, available at https://doi.org/10.1016/j.telpol.2016.01.004, at pp. 313-314.

[407] As at September 30, 2022, €1 is equal to $0.98.

[408] *See* Grzybowski, Lukasz, and Ambre Nicolle, "Estimating Consumer Inertia in Repeated Choices of Smartphones," *The Journal of Industrial Economics*, Vol. 69, No. 1, 2021, pp. 33-82, available at https://doi.org/10.1111/joie.12239, at p. 50.

[409] Google, "Technology Brief," June 15, 2010, GOOG-PLAY-003582582-585, at 582-583 [redacted]

[410] *See* Von Weizsäcker, C. Christian, "The costs of substitution," *Econometrica*, Vol. 52, No. 5, 1984, pp. 1085-1116, available at https://doi.org/10.2307/1910989, at p. 1089.

d) The Apple App Store does not constrain Android App Distribution

178. In evaluating whether the proposed Android App Distribution Market is a relevant antitrust market, I consider whether the Apple App Store (or other non-Android app stores) are a sufficient substitute for Android app stores. There are several reasons why the Apple App Store does not sufficiently constrain Android App Distribution on smart mobile devices.

e) OEMs cannot pre-install non-Android app stores

179. [redacted][411] If an OEM wanted to pre-install a non-Android App store, OEMs would first have to change their mobile device to run a non-Android mobile OS. However, this is challenging, as OEMs have limited choice when switching to a non-Android mobile OS.

180. The choices available to OEMs are either to develop their own mobile OS (as Apple and BlackBerry did) or license a third-party mobile OS (the choice made by Samsung and others). For example, Apple uses its own mobile OS, iOS, for its smart mobile devices, whereas Samsung uses Google's Android mobile OS for its smartphones and tablets.[412] Although OEMs can hypothetically choose to develop their own mobile OSs, few would do so in response to a SSNIP imposed on Android App Distribution. Mobile OSs are characterized by indirect network effects and economies of scale, and thus have high barriers to entry (as discussed in Section VI.A.3).[413]

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[411] [redacted] Q4 2020, GOOG-PLAY-006408321-343, at 322.

[412] *See*, *e.g.*, Samsung, "How can I check what version of Android I have on my device?" 2022, available at https://www.samsung.com/uk/support/mobile-devices/how-can-i-check-what-version-of-android-i-have-on-my-device/ ("All Samsung smartphones and tablets use the Android operating system, a mobile operating system designed by Google.").

[413] In the *United States v. Microsoft Corporation* case, the Court found that the Windows PC OS is protected by high barriers to entry from the consumer side and the developer side, which "would make it prohibitively expensive for a new Intel-compatible operating system to attract enough developers and consumers to become a viable alternative to a dominant incumbent in less than a few years." *See* "Court's Findings of Fact," *United States* v. *Microsoft Corporation*, Case No. 98-1232 (TPJ), available at https://www.justice.gov/atr/us-v-microsoft-courts-findings-fact#ii, at ¶¶ 30-32.

Moreover, developing a new mobile OS requires significant investments in research and development from designing to testing, which is not only costly but also time-consuming.[414]

181. OEMs would face the catch-22 of having to attract a critical mass of consumers to the OS at the same time as attracting developers to develop and program apps for the alternative mobile OS. Even if the programming of a new OS were surmountable on its own, the OS is not useful without a suite of apps that run on it. Developing *those* apps and APIs for integrations by third parties would be necessary to obtain scale. Now that the iOS and Android ecosystems have virtually saturated the market, as depicted in Exhibit 2 in Section III.A.2, high switching costs and network effects mean that such an effort would be difficult.

182. The other option available to OEMs, which is likely less expensive than developing their own mobile OS, would be to license a mobile OS from a third-party. Because proprietary mobile OSs, such as Apple's iOS and BlackBerry's now defunct mobile OS, are (or were) not available for license to other mobile device OEMs,[415] OEMs must select from the very limited licensable mobile OSs available, a list that is dominated by Google's Android OS, as depicted in Exhibit 4 in Section III.B above.[416]

(1) Android smart mobile device users also cannot install non-Android app stores

183. I also consider whether Android smart mobile device users could and would install non-Android app stores (*e.g.*, the Apple App Store) in response to a SSNIP on Android App Distribution. Users of Android smart mobile devices, like OEMs, also cannot install a non-Android

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[414] As documented in the EC Google Android Decision, it cost Amazon some "tens of millions of dollars" to develop its own Fire OS (a forked Android OS for Amazon Fire tablets). *See* EC Google Android Decision, ¶ 1039. *See also* TechPinas, "Eight Stages Of Mobile Operating System Development - An Overview For Young Techies," November 25, 2019, available at https://www.techpinas.com/2019/11/How-To-Create-Mobile-Operating-System.html.

[415] *See,* EC Google Android Decision, ¶¶ 239-240. The BlackBerry OS was discontinued in 2013, and new BlackBerry devices were based on the Android OS. *See*, *e.g.*, Bryant, Ben, "BlackBerry 10 Handsets Confirmed for January Launch," *The Telegraph*, November 12, 2013, available at https://www.telegraph.co.uk/technology/blackberry/9672758/BlackBerry-10-handsets-confirmed-for-January-30-launch html.

[416] *See also* EC Google Android Decision, ¶¶ 442-460 (showing the Google Android OS has been a leader in the market for licensable mobile OS in the world excluding China since 2011 with a market share of at least 72.0%).

app store on their Android smart mobile devices because non-Android app stores do not function on Android smart mobile devices – [redacted][417]

184. For example, apps designed to run on Android OSs are typically written in Java or Kotlin.[418] Because different Android OSs are based on similar code, it is easy for developers to make an app compatible for users of various Android OSs and distribute them via sideloading. In contrast, iOS apps are typically written in Objective-C or Swift, and developers would need to create two different versions of their app store for users of iOS and Android, which would only function on the respective OS that they were programmed for.[419] Developers of app stores must therefore create two distinct versions of an otherwise identical app store.

185. Consequently, if users of Android smart mobile devices want to switch to a non-Android app store, they would have to switch to a device with a non-Android app store (*e.g.*, an Android user would have to switch to an iPhone). However, as I discuss below, consumers show low propensity to switch to alternative mobile OS ecosystems due to the high costs of switching to a mobile device running an alternative OS. Google has also prevented developers from steering consumers to cheaper distribution methods (as discussed in Section IV.B.5). Therefore, consumers have little or no experience with developers steering them to discounted apps or in-app content.

(2) User switching among mobile OSs is limited

186. Data reflects that actual switching among mobile OSs is low, which corroborates my analysis of the various reasons why users do not switch. Users show a high degree of adherence to the mobile OS they currently use, and a resistance to switching. For example, the Presser Report conducted in 2022 found that there would be very limited switching between Android and iOS. The

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[417] [redacted] Q4 2020, GOOG-PLAY-006408321-343, at 326.

[418] *See*, *e.g.*, Ilyukha, Vitaliy, "How to Port Android Apps to iOS?," *Jelvix*, available at https://jelvix.com/blog/porting-android-apps-to-ios.

[419] *See*, *e.g.*, Ilyukha, Vitaliy, "How to Port Android Apps to iOS?," *Jelvix*, available at https://jelvix.com/blog/porting-android-apps-to-ios.

Presser Report found that, in response to an increase of five percent on Google Play Store pricing, with Apple App Store prices staying the same, only 3% of respondents said they would switch to an Apple iPhone.[420] Other evidence also indicates limited switching between Android and iOS devices, including Google documents, the CMA Consumer Survey, EC Google Android Decision, and other surveys.

187. First, Google's own evidence of limited switching includes:

- [redacted][421] [redacted][422]
- [redacted][426]

[420] Presser Report, p. 8.

[421] Google, [redacted] June 20, 2016, GOOG-PLAY-000572041.R-086.R, at 048.R.

[422] Google, [redacted] November 2018, GOOG-PLAY-004556784.R-813.R, at 793.R and Google, [redacted] January 2020, GOOG-PLAY-005705974.R-012.R, at 985.R.

[423] Google, "[redacted]" November 2, 2016, GOOG-PLAY-006398898.R-909.R, at 902.R.

[424] Google, [redacted]" July 21, 2019, GOOG-PLAY-004503351.R-368.R, at 355.R.

[425] The business unit that includes Google Play.

[426] Gold (Google) Deposition, p. 217 and Email from Brian Rakowski, Google, to Hiroshi Lockheimer, Senior VP of Platforms & Ecosystems for Google, [redacted] March 13, 2015, GOOG-PLAY-001802727-729, at 728 [redacted]

- [redacted][427] [redacted][428]
- [redacted][429] [redacted][430]
- [redacted][432] Exhibit 22 below is an excerpt [redacted]

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[427] [redacted] *See,* Google, [redacted] September 2020, GOOG-DOJ-19768791-817, at 792. *See also* Google, [redacted] January 2021, GOOG-DOJ-27418506-510, at 507. *See*, for example, a description of Lasso Regression, Glen, "Lasso Regression: Simple Definition," *StatisticsHowTo*, available at https://www.statisticshowto.com/lasso-regression/.

[428] *See* Google, [redacted] September 2020, GOOG-DOJ-19768791-817, at 799.

[429] *See* Google, "[redacted] November 2018, GOOG-PLAY-004556784-813.R, at 793.R. *See also* Google, [redacted]" August 2019, GOOG-PLAY-005607169.R-207.R, at 180.R.

[430] Google, [redacted] August 2018, GOOG-PLAY-000096813.R-844.R, at 840.R.

[431] *See, e.g.*, Google, "[redacted] January 18, 2017, GOOG-PLAY-000880576.R-645.R, at 606.R and 616.R.

[432] Google, [redacted] January 31, 2017, GOOG-PLAY- 007317466-520, at 467 and 473.

Exhibit 22

[redacted]

Source: Google, [redacted] January 18, 2017, GOOG-PLAY-000880576.R-645.R, at 589.R.

188. Second, the CMA as part of their Mobile Ecosystems Market Study undertook a study into consumer purchasing behavior in the UK smartphone market.[433] This survey showed that only 5% of Android users had switched from an iOS device with their most recent Android smart mobile device purchase (while 8% of iOS users switched from an Android with their most recent iPhone purchase).[434] In addition, of those who had not switched, only 12% of Android users even *considered* buying/getting an iPhone.[435] The survey also found:

- The most important factors for Android users in their decision to buy their current smartphone were screen size and quality (56%), overall price (54%), and battery life (51%). Only 15% chose range and quality of mobile apps available on the device, and 11% chose price of subscriptions/content for apps available on the device.[436]

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[433] CMA Consumer Survey, p. 1.
[434] CMA Consumer Survey, Figure 16.
[435] CMA Consumer Survey, Figure 24.
[436] CMA Consumer Survey, Figure 5.

- The top reasons why Android users didn't consider switching to an iPhone were: Too expensive (60%); I am happy with/prefer Android (54%); and I identify more closely with Android than iOS (44%).[437] The survey also identified some potential barriers to switching including "I didn't want to spend the time learning how to use an iPhone" (28%), "Because I have other devices linked to my phone/operating system (Android)" (25%), and "I felt it would be too much hassle to switch to an iPhone" (18%).

189. Third, the EC Google Android Decision concluded that Android users are unlikely to switch between Android and iOS, citing evidence from the Yandex Survey[438] that over 90% of Android users in the UK were likely to continue purchasing a new Android smartphone.[439] The EC Google Android decision also refuted Google's claims that "a substantial number of users have switched, or would be willing to switch" or that "the degree of competition for first time buyers of smart mobile devices would be sufficient to protect existing Android smart mobile device users."[440]

190. Finally, other survey evidence suggests there is limited substitution between Android and iOS devices.

- BankMyCell, a price comparison website for electronics recycling, collected data from 38,043 consumers who traded in their phones from October 2018 to June 2019. They found that 12.4% of iPhone owners traded their phones for Samsung smartphones and 6.4% for LG smartphones, whereas only 7.7% of Galaxy S9 users switched to an iPhone (with 92.3% remaining on the Android OS).[441]

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[437] CMA Consumer Survey, Figure 27.

[438] *See* EC Google Android Decision, ¶ 533.

[439] *See* EC Google Android Decision, ¶¶ 533-534.

[440] *See* EC Google Android Decision, ¶¶ 535-551.

[441] This survey is based on a dataset containing 38,043 unique Apple iPhone users (of which 26,724 unique iPhone users with defined smartphone models) and 468 unique users in the Galaxy comparison study. The survey's online audiences are 62.4% millennials and 37.6% aged 36-65, with a nearly 6:4 female to male split. *See* Turner, Ash, "iPhone Brand Loyalty Study at Trade-in," *BankMyCell*, available at https://www.bankmycell.com/blog/iphone-trade-in-loyalty-study/.

- The adherence rate of Android and iOS users in the U.S. continued to rise in 2017 with only 9% of Android users switching to iOS.[442]
- The Presser Report found that between 71% and 78% of respondents believe it would take "a lot" or "some" effort to switch from Android to iOS.[443]

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191. I therefore conclude that consumers face high costs if they wish to switch from Android to iOS, or vice versa, and that in reality consumers who already own a smart mobile device – the vast majority of consumers, as noted above – tend to adhere to their present OS when purchasing a new smart mobile device. This is evidence that the terms and conditions of distribution of Android apps are not constrained by competition from the Apple App Store. In sections that follow, I also consider whether other alternative app distribution methods, such as non-Android mobile device app stores, app stores on PCs or gaming consoles, or web-based apps, are sufficient constraints such that the market is wider than Android App Distribution.

(3) Developers' incentive to multi-home does not constrain Android App Distribution

192. Potential switching by developers also does not constrain Android App Distribution. App developers want to reach as many device users as possible. Mobile device users tend to use either Android or iOS devices (and very rarely multi-home/use both).[444] [redacted][445]

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[442] *See*, *e.g.*, Jones, Chuck, "Apple's iOS Loyalty Rate Is Lower Than Google's Android, But Apple May Steal More Users Each Year," *Forbes,* March 10, 2018, available at https://www forbes.com/sites/chuckjones/2018/03/10/apples-ios-loyalty-rate-is-lower-than-googles-android-but-apple-may-steal-more-users-each-year/?sh=2208012a68a8.

[443] Presser Survey, p. 8.

[444] CMA Final Report on Mobile Ecosystems, ¶ 3.40.

[445] Chu (Meta Platforms (formerly Google)) Deposition, p. 46 [redacted]

Therefore, as described in Section III.B, app developers have strong incentives to multi-home by making their apps available for Android and iOS, in order to harness the volume and value of users on each mobile OS.[446,447] Multi-homing is especially important for apps that facilitate interactions among users, such as apps with a social networks component.

193. [redacted]"[449]

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194. In summary, I conclude that the possibility that OEMs might adopt a different, non-Android operating system does not constrain the behavior of Android app distributors. I similarly conclude that Android users cannot constrain Android app developers by installing a non-Android app store on Android smart mobile devices. Finally, the possibility of developers developing apps for Apple's App Store, or some other non-Android store, does not constrain the behavior of Android app distributors.

f) Basic or feature phones are not a substitute for Android App Distribution

195. I do not consider basic or feature phones part of the Android App Distribution Market, as they lack the features, capabilities, and app functionality of smart mobile devices and,

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[446] Varian, Hal, [redacted] GOOG-PLAY4-006018159-187, at 177 ([redacted]

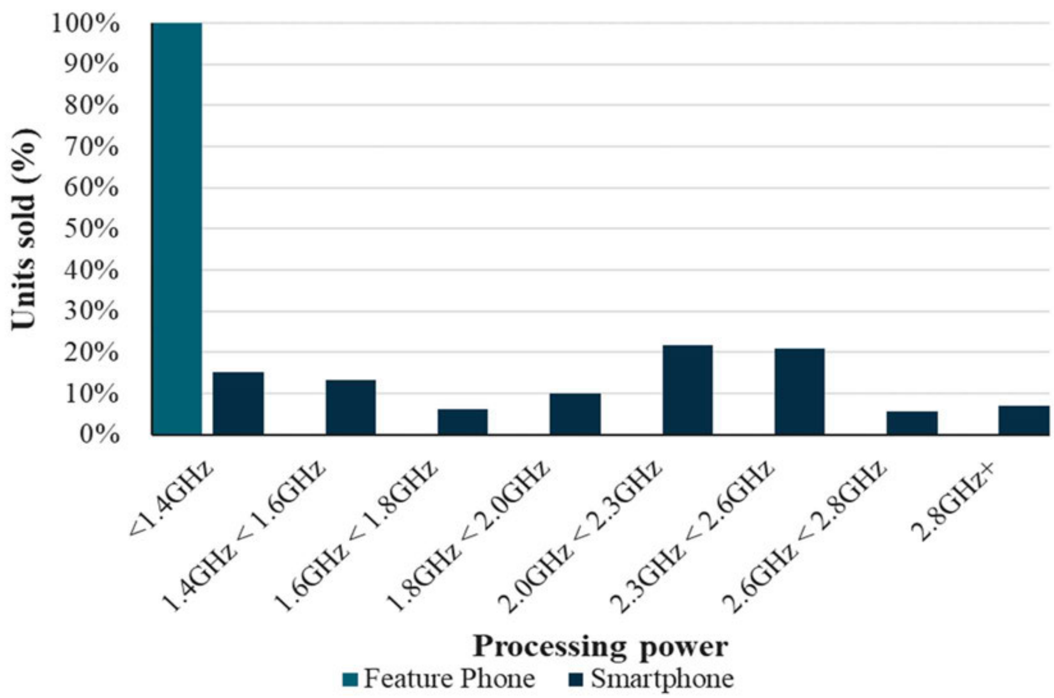
[447] For example, the EC found that developers produce apps for 2.2 OSs (non-games) and 2.6 OSs (games) on average. *See* EC Google Android Decision, ¶ 554.

[448] *See* Google, "Report of Dr. Itamar Simonson," February 8, 2016, GOOG-PLAY-007317611-634 (hereafter "Simonson Report"), at 614.

[449] *See* Simonson Report, 615.

thus, Android smart mobile device users, who have chosen to purchase a smart mobile device, would not switch to these basic devices in response to a small, significant non-transitory price increase on Android App Distribution. As explained above in Section III.A.1, these non-smart mobile devices merely offer simple services such as voice calling, text messaging, and limited web browsing. Feature phones also lack the processing power memory capability of smart mobile devices. As shown in Exhibit 23 below, all feature phones have processor speeds less than 1.4GHZ, while on average from 2017 to 2021, more than half of smartphones had speeds greater than 2GHZ.

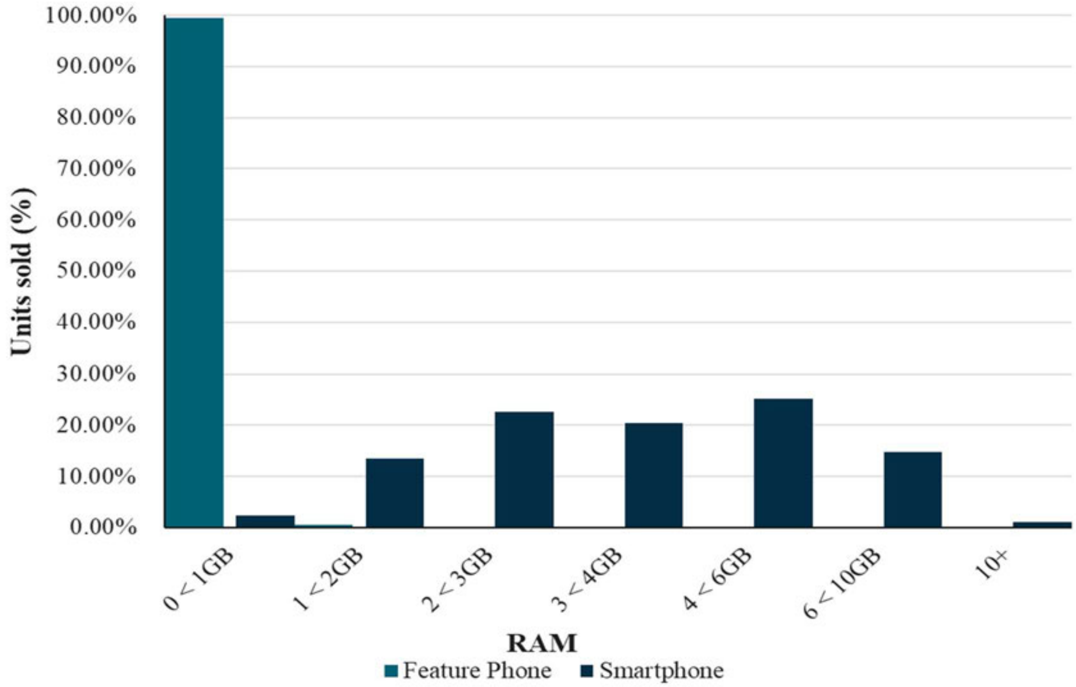
Exhibit 23
Processor Power of Feature Phones and Smartphones, Worldwide (excluding China), 2017 – 2021



Source: IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.

196. In addition, as shown in Exhibit 24 below, feature phones have much lower random-access memory (RAM) than smartphones. From 2017 to 2021, all feature phones had on average less than 2GB (and 99% less than 1GB), while more than half of smartphones had RAM above 3GB.

Exhibit 24
RAM in Feature Phones and Smartphones,
Worldwide (excluding China), 2017 – 2021



Source: IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.

197. Therefore, based on the differences in functionality and capability (including the processor speed and memory available), I do not consider basic and feature phones to be in the same market as smart mobile devices.

g) App stores on PCs or gaming consoles are not a substitute for Android App Distribution

198. I also find App stores on PCs or gaming consoles are not a substitute for Android App Distribution, due to several differences between their apps and OSs.

(1) OEMs cannot substitute PC or console App Distribution for Android App Distribution

199. From an OEM perspective, technical standards mean OEMs of smart mobiles devices cannot install OSs (and therefore app stores) for PCs or gaming consoles on their smart

mobile devices.[450] I understand that gaming consoles are designed for a very specific purpose and therefore the OSs that are developed for them are bespoke and not suitable for general purpose applications.[451] In addition, I understand that PC OSs, while more general in purpose, are not designed for smart mobile devices, which have smaller screens, focus on wireless functionality, and run on very different hardware, as noted by smartphone OEMs, such as Samsung and Nokia:[452]

> Smart mobile device OSs constitute a separate market from PC and Desktop OSs. Smart mobile device OSs are customized for smaller screen sizes, mobile functions, wireless functions, and apps that are better suited for simpler mobile devices rather than PC OSs, which are designed for higher performance CPUs and larger screens, and greater drive storage capabilities.
>
> . . .
>
> The hardware requirements for a mobile OS are significantly different from a PC[']s OS *e.g.*, in terms of processors, memory, display, and power management. In most cases, the applications developed in the mobile environment are also specific to the mobile domain and not shared with the PC environment, and vice versa.

(2) App usage and user experience differ for PCs and game consoles and smart mobile devices

200. Smart mobile devices have replaced PCs and gaming consoles for various purposes that make use of smart mobile devices' portability (*e.g.*, maps, social media, or dating apps) or their unique hardware (*e.g.*, motion-based navigation). Apps serving these functions often have little to no value on desktop computers or gaming consoles. Apps that are designed with the unique hardware of smart mobile devices in mind (*e.g.*, touch screens, accelerometers, or gyroscopes) also often do not function with a mouse or video game controller used with PC and gaming console

[450] *See*, *e.g.*, Java T Point, "Difference between Mobile Operating System and Desktop Operating System," available at https://www.javatpoint.com/mobile-operating-system-vs-desktop-operating-system#:~:text=Mobile%20OS%20handles%20cellular%20and,including%20mouse%2C%20keyboard%2C%20etc.

[451] *See*, *e.g.*, Yordanov, Alexander, "How the new generation of consoles will affect PC Gaming," Sapphire Nation, January 28, 2021, available at https://www.sapphirenation net/how-the-new-generation-of-consoles-will-affect-pc-gaming ("Console operating systems are optimized exclusively for gaming, so it will take a PC CPU that is significantly faster to guarantee superior performance[.]"); and Brightwiz, "Get the Scoop on PC vs Console Gaming," December 16, 2016, available at https://brightwhiz.com/pc-vs-console-gaming/ ("Gaming consoles usually have optimized operating systems and internal applications designed specifically for one thing or one set of things. The PC, on the other hand, hosts a general purpose operating system.").

[452] *See* EC Google Android Decision, ¶ 223.

apps, and vice versa.[453] A large proportion of consumers also predominantly use certain services via mobile apps, including instant messages (88%), dating (85%), weather (81%), maps/GPS/traffic (76%), and food (76%).[454] Also, during 2020, a new app category of Covid-tracing or symptom tracking apps emerged, services that were only available via mobile.[455] Consumers are also increasingly attached to smart mobile devices thanks to the convenience of using them whenever and wherever; for example, in 2021 Americans spent an average of 4.1 hours daily on mobile devices. [456]

201. PCs and gaming consoles have vastly different characteristics than smart mobile devices and are generally not substitutable for one another. Desktop PCs and most gaming consoles are large, heavy devices that generally stay in one place. While laptop computers can be carried from place to place, they generally require a stable resting place for access. Smartphones, on the other hand, are slender gadgets that can be slipped into a pocket and accessed in myriad circumstances, including while walking, waiting in a meeting, or riding transit. [redacted][457] For example, while ride sharing apps such as Uber or Lyft allow a user to book a trip on a PC, the web-based app cannot track the car's

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[453] Google, "Play Sandbox," 2021, GOOG-PLAY-000338400.R-552.R, at 484.R ([redacted]").

[454] *See*, *e.g.*, Comscore, "Global State of Mobile," 2019, available at https://www.comscore.com/Insights/Presentations-and-Whitepapers/2019/Global-State-of-Mobile, at p. 8.

[455] *See*, *e.g.*, Comscore, "Global State of Mobile," November 2020, available at https://www.comscore.com/content/download/51336/2998036/file/2020_Global_State_of_Mobile.pdf, at p. 9.

[456] *See* Data.ai, "State of Mobile 2022," 2022, available at https://www.data.ai/en/go/state-of-mobile-2022/, at p. 6 ("Users in Brazil, Indonesia and South Korea surpassed 5 hours per day in mobile apps in 2021. The average American watched 3.1 hours of TV a day, whereas they spent 4.1 hours on their mobile device in 2021").

[457] [redacted] *See* Google, "Android Staples," February 11, 2017, GOOG-PLAY-000570075.R-124.R, at 078.R.

location and arrival time while waiting outside.[458] [redacted].[459] Additionally, social media apps such as Facebook, Snapchat, and Instagram are almost exclusively used on smartphones.[460] Comscore found that smartphones made up 92% of the time users spend on social media apps.[461]

202. Finally, dating apps are designed specifically for smart mobile devices due to their portability and GPS functions.[462] Comscore data from 2020 shows that 85% of users were using dating apps exclusively through smart mobile devices.[463] [redacted][465] Thus, distribution of apps on PCs and gaming consoles is not a substitute for, and would not constrain, Android App Distribution.

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458 Lyft noted specifically on its website that transit information is not available from a web browser. *See*, for example, Lyft, "How to request a ride," available at https://help.lyft.com/hc/e/all/articles/115013079988-How-to-request-a-ride#r4o.

459 *See* Rysman Workpapers.

460 Garcia, Rodora, "What Are The Types Of Social Media Apps?" *Cellular News*, July 22, 2022, available at https://cellularnews.com/mobile-apps/what-are-the-types-of-social-media-apps/.

461 Comscore, "Global State of Mobile," 2019, available at https://www.comscore.com/Insights/Presentations-and-Whitepapers/2019/Global-State-of-Mobile, at p. 11.

462 Chuks, Rebecca, "The power of proximity: how location data affects your love life," *Here*, February 14, 2020, available at https://www here.com/company/blog/location-intelligence-dating-apps and Castro, Angel and Juan R. Barrada, "Dating Apps and Their Sociodemographic and Psychosocial Correlates: A Systematic Review," *Int J Environ Res Public Health*, Vol. 17, No. 18, September 2020, available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7557852/pdf/ijerph-17-06500.pdf, at p. 17.

463 "Comscore, "Global State of Mobile," November 10, 2020, available at https://www.comscore.com/Insights/Presentations-and-Whitepapers/2020/Global-State-of-Mobile, at p. 6.

464 Dixon, S., "Most popular dating apps worldwide as of May 2021, by number of monthly downloads," *Statista*, April 28, 2022, available at https://www.statista.com/statistics/1200234/most-popular-dating-apps-worldwide-by-number-of-downloads/.

465 *See* Rysman Workpapers.

203. Consumers also purchase gaming consoles for a very particular purpose (*i.e.*, playing games), while smart mobile devices have a much wider functionality than gaming.[466] This explains why many Android users already own all three types of devices (a smartphone, PC, and gaming console). For example, the CMA Consumer Survey found that 65% of Android users owned a personal windows laptop/desktop computer, and 34% owned a gaming console.[467] Further, if the consumer had an Android smart mobile device but did not already have a PC or gaming console, they would have to purchase new hardware to access the alternative app distribution methods, further lowering the likelihood they would switch. The types of games on mobile platforms and non-mobile platforms are also different in a way that mobile games tend to be casual games that appeal to mass audiences, whereas PC and console games have higher quality, offer a more immersive experience and attract more dedicated gamers.[468] Moreover, a comparison of the top 45 apps on the Google Play Store and Steam show almost no overlap; I found only three apps were on both, as depicted in Exhibit 25 below.

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[466] Barder, Ollie, "Millions Of Gamers Are Still Buying Consoles, Here Is Why," *Forbes,* February 10, 2015, available at https://www forbes.com/sites/olliebarder/2015/02/10/millions-of-gamers-are-still-buying-consoles-here-is-why/?sh=73bef8d76dc5.

[467] *See* CMA Consumer Survey, Figure 21.

[468] *See, e.g.,* Starloop Studios, "Mobile Games Vs. PC Vs. Console Games: What Market is the Best Bet?" available at https://starloopstudios.com/mobile-games-vs-pc-vs-console-games-what-market-is-the-best-bet/#:~:text=Mobile%20games%20offer%20users%20the,console%20games%20are%20the%20winner.

Exhibit 25
Point-in-Time Comparison of Top Apps on Google Play Store and Steam Store

Rank	Steam (24-Hour Peak)	Google Play - Free (Current)	Google Play - Paid (Current)
1	Counter-Strike: Global Offensive	Power of Women: Genesis	Minecraft
2	Dota 2	Survivor.io	Geometry Dash
3	Apex Legends	Stumble Guys	Bloons TD 6
4	PUBG: BATTLEGROUNDS	Save the Doge	Rovio Classics: AB
5	Lost Ark	Stick War: Hero Tower Defense	Stardew Valley
6	Grand Theft Auto V	Pull the Pin	MONOPOLY - Classic Board Game
7	NARAKA: BLADEPOINT	Roblox	Terraria
8	Destiny 2	Epic Heroes- Save Animals	Grand Theft Auto: San Andreas
9	Team Fortress 2	Crowd Evolution!	DraStic DS Emulator
10	Wallpaper Engine	2248 - Number Puzzle	My Boy! - GBA Emulator
11	Rust	School Party Craft	Grand Theft Auto: Vice City
12	Cyberpunk 2077	Draw Monster 3D	Mini Metro
13	Football Manager 2022	Basket Battle	Poppy Playtime Chapter 2
14	War Thunder	Stormshot	Incredibox
15	ARK: Survival Evolved	Woodoku	Papers, Please
16	Unturned	Tall Man Run	Poppy Playtime Chapter 1
17	Warframe	Become a Queen	Inron Marines Invasion
18	Tom Clancy's Rainbow Six Siege	Rainbow Friends, Rope Game	The Game of Life 2
19	Total War: WARHAMMER III	Lifting Hero	Five Nights at Freddy's
20	FIFA 22	Fill The Fridge	Slay the Spire
21	Sid Meier's Civilization VI	Truckers of Europe 3	The Room
22	Dead by Daylight	Madden NFL 23 Mobile Football	Poly Bridge
23	DayZ	Subway Surfers	Bloons TD 5
24	Rocket League	Bridge Race	Wingspan: The Board Game
25	MIR4	Going Balls	The House of Da Vinci 3
26	PAYDAY 2	Merge Monster: Rainbow Friends	2112TD: Tower Defense Survival
27	New World	Royal Match	Dawncaster: Deckbuilding RPG
28	Yu-Gi-Oh! Master Duel	Coffee Stack	Papa's Freezeria To Go!
29	FINAL FANTASY XIV Online	Rainbow Craft: Hide and Seek	Pizza Boy GBA Pro
30	Path of Exile	Count Masters: Stickman Games	The Game of Life
31	Euro Truck Simulator 2	Craft World - Master Block 3D	Bad North: Jotunn Edition
32	Hearts of Iron IV	Parking Jam 3D	Hitman Sniper
33	The Scroll Of Taiwu	Wordscapes	Ultimate Custom Night
34	ELDEN RING	Collect Em All! Clear the Dots	True Skate
35	MONSTER HUNTER RISE	Candy Crush Saga	Five Nights at Freddy's 2
36	World of Tanks Blitz	Uboat Attack	Pocket City
37	Farming Simulator 22	Tap Away	Exploding Kittens - Official
38	Garry's Mod	8 Ball Pool	My OldBoy! - GBC Emulator
39	Terraria	Rope and Demolish	Poly Bridge 2
40	Source SDK Base 2007	Cyber Surfer: Beat&Skateboard	Human : Fall Flat
41	Europa Universalis IV	Button Fever	Grand Theft Auto III
42	Conan Exiles	Zombie Defense	RFS - Real Flight Simulator
43	Stardew Valley	Township	ScourgeBringer
44	Stumble Guys	Lunch Box Ready	Where's My Water?
45	Spacewar	Super Dragon Hero Game	RollerCoaster Tycoon Classic

Notes:

1. This exhibit depicts the top 45 games in the Steam Store and the Google Play Store at 11:13am on September 21, 2022. I understand the Steam Store rankings are global, while the Google Play Store rankings might vary across different geographies. This exhibit depicts the Google Play Store rankings as they appear in the U.S.
2. Column "Steam (24 Hour Peak)" depicts the top 45 apps available in the Steam Store based on the 24-hour peak number of players (see column "24h Peak" in source 2).
3. Column "Google Play – Free (Current)" depicts the top 45 free phone game apps available in the Google Play Store and column "Google Play – Paid (Current)" depicts the top 45 paid phone game apps in the Google Play Store. These top apps update frequently throughout the day to reflect current top apps. Google Play does not specify the metrics utilized to categorize apps as "top"; however, this is likely based on downloads.

Sources:

1. Google, "Games," Google Play Store, available at https://play.google.com/store/games.
2. Steam, "Most Played Games," *SteamDB*, available at https://steamdb.info/graph/.

204. Additionally, the volume of gaming apps on the Play Store overwhelmingly surpasses that on gaming consoles such as Steam, Switch, and PlayStation. There were approximately 478,000 gaming apps available on the Play Store as of the second quarter of 2022. In contrast, the number of games on Steam, Switch, and PlayStation is approximately 50,000 thousand, 5,000, and 4,000, respectively.[469] Therefore, from a consumer perspective, PCs or gaming consoles cannot be considered as reasonable substitutes for smart mobile devices.

(3) App developers do not consider PC or console app distribution and Android App Distribution as substitutes

205. In addition to limited substitution from consumers and OEMs, as discussed above, developers also would not substitute from Android App Distribution to PC or console app distribution. From developers' perspective, OSs for PCs and game consoles have technically different requirements from mobile OSs, so the apps developed for different platforms must accommodate these different specifications. OS developers such as Nokia, for example, have stated

[469] *See* Clement, J., "Number of available gaming apps in the Google Play Store from 1st quarter 2015 to 2nd quarter 2022," *Statista*, August 30, 2022, available at https://www.statista.com/statistics/780229/number-of-available-gaming-apps-in-the-google-play-store-quarter/; Wise, Jason, "How many games are there on Steam in 2022?" *Earthweb*, August 5, 2022, available at https://earthweb.com/how-many-games-are-on-steam/#:~:text=This%20makes%20us%20all%20wonder,list%20every%20year%20since%202017.; Nintendo, "Nintendo Switch," available at https://www nintendo.com/switch/system/; and Adler, Matthew, "PS5: 'Majority of the 4,000+ PS4 Titles' Will be Backwards Compatible, Sony Says," *IGN*, March 27, 2020, available at https://www.ign.com/articles/ps5-majority-of-the-4000-ps4-titles-will-be-backwards-compatible-sony-says.

that because the "hardware requirements for a mobile OS are significantly different from a PCs," mobile apps are "specific to the mobile domain and not shared with the PC environment, and vice versa." Similarly, Amazon stated that "apps developed for a mobile OS may not function (or may not function as well) on a device using an OS for PCs (and vice versa)."[470]

206. Generally speaking, apps developed for mobile OSs are able to handle cellular/wireless connectivity and use touchscreens.[471] In contrast, PC and console OSs have a higher power requirement (*e.g.*, PC OSs are generally not optimized for power usage and have a high requirement for CPU capacity) and support many input devices (*e.g.*, computer mice, game controllers, headphones, microphones, etc.), so PC software is usually developed for specific purposes (*e.g.*, system software and programming software).[472]

207. Games are also developed differently for these different platforms (though cross-platform games are increasing[473]). For example, games on smart mobile devices are usually lower quality, have limited genres (due to smaller screens), generally do not support external controllers, and damage the battery compared to games on PCs or gaming consoles, which have higher resolution and faster gaming speeds.[474] Also, as discussed in Section III.B, developers who do not currently develop their apps on PC/consoles, would have to incur additional expense writing code and building their app in a different environment (and consoles would only be applicable for gaming developers). Finally, in 2021, according to WePC, the smartphone and tablet games market

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[470] *See* EC Google Android Decision, ¶¶ 221-223.

[471] *See*, *e.g.*, Java T Point, "Difference between Mobile Operating System and Desktop Operating System," available at https://www.javatpoint.com/mobile-operating-system-vs-desktop-operating-system#:~:text=Mobile%20OS%20handles%20cellular%20and,including%20mouse%2C%20keyboard%2C%20etc.

[472] *See*, *e.g.*, Java T Point, "Difference between Mobile Operating System and Desktop Operating System," available at https://www.javatpoint.com/mobile-operating-system-vs-desktop-operating-system#:~:text=Mobile%20OS%20handles%20cellular%20and,including%20mouse%2C%20keyboard%2C%20etc and Wilcox, Lacey, "The 4 Main Types of Software," *Primitive,* March 30, 2021, available at https://www.leadwithprimitive.com/blog/the-4-main-types-of-software.

[473] *See*, *e.g.*, Conroy, Shaun, "Cross platform games & crossplay games explained 2022," *WePC*, August 16, 2022, available at https://www.wepc.com/tips/cross-platform-games/.

[474] *See*, *e.g.*, Starloop Studios, "Mobile Games Vs. PC Vs. Console Games: What Market is the Best Bet?" available at https://starloopstudios.com/mobile-games-vs-pc-vs-console-games-what-market-is-the-best-bet/#:~:text=Mobile%20games%20offer%20users%20the,console%20games%20are%20the%20winner.

was worth more than the console and PC games markets combined (with 51.6% of the total games market).[475] Therefore, smart mobile device apps have become far too substantial for gaming developers to ignore and switch to developing only PC and/or console games. In summary, developers face many hurdles when substituting between developing apps for smart mobile devices and developing apps for PCs and gaming consoles.

208. As described in Section VII.B.3, app stores on PCs, such as the Microsoft Store and the Epic Games store, often charge a commission of 12%.[476] This is much lower than Google's average commission of 29.85%.[477] The fact that this difference persists (*i.e.*, Google has not materially adjusted its pricing in response to these lower fees) suggests developers see Android App Distribution (and the Google Play Store in particular) as a unique/separate distribution platform that is not subject to competition from these PC app stores.

209. Finally, PC/console app distribution may compete more closely with Android App Distribution if many apps and games worked across all three platforms (also referred to as "cross-platform").[478] [redacted][479] Even among gaming apps that can be played cross-platform, there is limited multi-homing by users. [redacted][480] On the other hand, Google and Amazon (*i.e.*, mobile focused companies) would

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[475] *See* WePC, "PC Gaming Statistics 2022," June 10, 2022, available at https://www.wepc.com/statistics/pc-gaming/.

[476] *See* Warren, Tom, "Microsoft shakes up PC gaming by reducing Windows store cut to just 12 percent," *The Verge*, April 29, 2021, available at www.theverge.com/2021/4/29/22409285/microsoft-store-cut-windows-pcgames-12-percent.

[477] This is averaged across all developers who have incurred transactions with U.S. consumers from January 2012 to July 2021. *See* Google Transaction Data. *See* Rysman Workpapers.

[478] Cross-platform is "a term used to refer to a piece of software that is compatible with more than one system. For example, the popular media player VLC is compatible with the three major desktop operating systems: Microsoft, Mac OS, and Linux. Cross-platform support can also extend to mobile devices, with many apps available on both the Apple App Store and the Google Play Store." *See* Vicente, Vann, "What does cross-platform mean for gaming and other apps?" *How-To Geek*, October 9, 2021, available at https://www howtogeek.com/752370/what-does-cross-platform-mean-for-gaming-and-other-apps/.

[479] Google, "Game Change: The Future of Videogames," May 2019, GOOG-PLAY-000231487-551, at 538.

[480] *See* [redacted]

find it easier to challenge Sony and Microsoft (the two largest gaming console providers) via cloud gaming[481], [redacted][482]

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210. Thus, because (i) app stores on PCs and gaming consoles operate on a different OS platform, with different technical requirements, (ii) consumers use PC and gaming consoles for different purposes (due to differences in functionality), and thus are unlikely to view the two platforms as a substitute to Android; (iii) developers are unlikely to view mobile app stores and PC/gaming console app stores as substitutes because they want to access different sets of consumers and thus distribute apps where they can reach their target audience, I conclude that PC or gaming console app stores are not in the same market as Android App Distribution methods, as my SSNIP test excluding them, in Section V.C.5 below, demonstrates.

h) Substitution between web-based apps and mobile apps is limited

211. I also consider whether consumers and developers would switch to web-based apps in response to a price increase in Android App Distribution and conclude web-based apps are not a reasonable substitute for native mobile apps on Android mobile devices. Web apps require internet connection and do not provide the same features and functionality as mobile apps, thereby providing an inferior user experience.[483] Moreover, as explained below, data indicates that users spend far more time and money on mobile apps than web apps.

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[481] Roach, Jacob and Kevin Parrish, "What is cloud gaming?" *Digital Trends*, March 29, 2021, available at https://www.digitaltrends.com/gaming/what-is-cloud-gaming-explained/ ("Cloud gaming is a method of playing video games using remote servers in data centers. There's no need to download and install games on a PC or console. Instead, streaming services require a reliable internet connection to send gaming information to an app or browser installed on the recipient device. The game is rendered and played on the remote server, but you see and interact with everything locally on your device").

[482] Google, "Game Change: The Future of Videogames," May 2019, GOOG-PLAY-000231487-551, at 489.

[483] Email from Mike Cleron, Google, to Hiroshi Lockheimer, Senior Vice President of Platforms & Ecosystems for Google, "[redacted]" December 10, 2014, GOOG-PLAY-004449004-006 at 004 ([redacted]).

212. [redacted][489]

213. Mobile apps can often be used "offline" (*i.e.*, without an internet connection). For example, content on streaming apps can be downloaded to the smart mobile device for enjoyment even when an internet connection is unavailable, and some Android gaming apps can be played offline.[490] By contrast, web apps require connection to the internet.[491]

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[484] Google, "Different 'App-like' Experiences," GOOG-PLAY-001882239.R-299.R, at 256.R.

[485] Google, "Different 'App-like' Experiences," GOOG-PLAY-001882239.R-299.R, at 260.R-261.R.

[486] Google, "Different 'App-like' Experiences," GOOG-PLAY-001882239.R-299.R, at 264.R.

[487] Google, "Different 'App-like' Experiences," GOOG-PLAY-001882239.R-299.R, at 265.R.

[488] Google, "Different 'App-like' Experiences," GOOG-PLAY-001882239.R-299.R, at 267.R-272.R.

[489] Google, "Different 'App-like' Experiences," GOOG-PLAY-001882239.R-299.R, at 274.R.

[490] Google Play provides a list of offline apps. *See*, *e.g.*, Google, "Offline Games," available at https://web.archive.org/web/20220809221424/https://play.google.com/store/apps/collection/promotion_3000933_offlinegamemea?clp=CigKJgogcHJvbW90aW9uXzMwMDA5MzNfb2ZmbGluZWdhbWVtZWEQShgD:S:ANO1ljJOybU&gsr=CioKKAomCiBwcm9tb3Rpb25fMzAwMDkzM19vZmZsaW5lZ2FtZW1lYRBKGAM%3D:S:ANO1ljLzKRU&hl=en. *See also* Griffith, Eric, "How to download video from your favorite streaming service," *PCMag*, April 2, 2020, available at https://www.pcmag.com/how-to/how-to-download-video-from-your-favorite-streaming-service and Hindy, Joe, "15 best offline Android games that require no WiFi," *Android Authority*, May 4, 2022, available at https://www.androidauthority.com/best-offline-android-games-669279/.

[491] *See*, *e.g.*, GeeksforGeeks, "Difference between Native Apps and Web Apps," March 31, 2021, available at https://www.geeksforgeeks.org/difference-between-native-apps-and-web-apps/#:~:text=Native%20apps%20are%20faster%20than,approved%20by%20the%20App%20Store.

214. Mobile apps sometimes have features that are not available on the website equivalent. For example, Instagram's features such as dark mode or uploading stories are only available on its mobile app.[492] While consumers can access many online services through web browsers on their smartphones, websites often have longer response times (web-based apps run slower than native apps) and are harder to navigate, resulting in a worse user experience (as noted above, web-based apps also cannot work without an internet connection).[493]

215. Moreover, the significant difference in performance and features between web-based apps and native mobile apps has led many developers to either abandon or deprioritize the web-based version of their apps.[494] For example, in 2012 Facebook decided to move away from an HTML5 version to launching an Android native app because of limitations in "performance and feature set" such as sub-optimal experience of using cameras on the mobile web.[495] As another example, popular apps such as WhatsApp and Pokémon GO are only available on Android smart mobile devices as native apps.[496]

216. Evidence indicates users have navigated to the superior experience of mobile apps. For example, a Comscore report shows consumers spend the overwhelming majority (greater or

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[492] *See*, *e.g.*, Hindustan Times, "5 features you can use on the Instagram app but not on Instagram website," January 15, 2020, available at https://tech hindustantimes.com/tech/news/5-features-you-can-use-on-the-instagram-app-but-not-on-instagram-website-story-NeLHrjG7H65ABNJ4Ae2u4N.html.

[493] *See*, *e.g.*, GeeksforGeeks, "Difference between Native Apps and Web Apps," March 31, 2021, available at https://www.geeksforgeeks.org/difference-between-native-apps-and-web-apps/#:~:text=Native%20apps%20are%20faster%20than,approved%20by%20the%20App%20Store and Rooche, "What are the Benefits of Native App?" June 20, 2022, available at https://rooche net/benefits-of-native-app/.

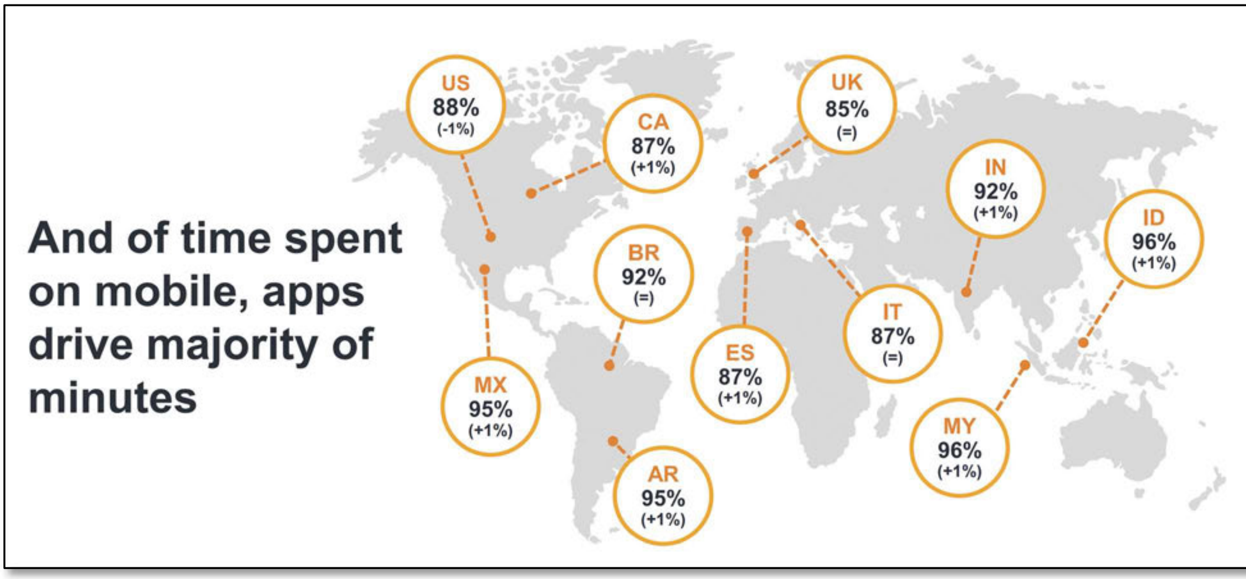
[494] *See*, *e.g.*, Montecuollo, Michael, "Native or Web-Based? Selecting the Right Approach for Your Mobile App," *UX Magazine*, January 29, 2014, available at https://uxmag.com/articles/native-or-web-based-selecting-the-right-approach-for-your-mobile-app.

[495] *See*, *e.g.*, Langel, Tobie, "Introducing the Mobile W3C Community Group," *Facebook Developers*, February 27, 2012, available at https://web.archive.org/web/20120511110804/http://developers.facebook.com/html5/blog/post/2012/02/27/introducing-the-mobile-w3c-community-group/. *See also* Reisinger, Don, "Facebook close to launch of native Android app – report," *CNET,* October 8, 2012, available at https://www.cnet.com/tech/services-and-software/facebook-close-to-launch-of-native-android-app-report/.

[496] Google, "Different 'App-like' Experiences," GOOG-PLAY-001882239.R-299.R, at 256.R. *See*, *e.g.*, Nguyen, Kim Anh, "Top 7 best native app example in 2022 that merchants can learn from," *Magenest*, November 30, 2021, available at https://magenest.com/en/native-app-example/.

equal to 85 percent in all countries shown) of their mobile time in native apps, as illustrated in Exhibit 26 below.[497]

Exhibit 26
Proportion of Time Spent on Mobile Apps Globally Excluding China, 2020



Source: Comscore, "Global State of Mobile," November 2020, available at https://www.comscore.com/content/download/51336/2998036/file/2020_Global_State_of_Mobile.pdf, slide 5.

217. Additionally, as shown in Exhibit 27 below, consumers spend overwhelmingly less on web apps than they do on smartphones and tablets combined. [redacted][498]

[497] *See*, *e.g.*, Comscore, "Global State of Mobile," November 2020, available at https://www.comscore.com/content/download/51336/2998036/file/2020_Global_State_of_Mobile.pdf, at p. 5.

[498] *See* Rysman Workpapers. Note: The data includes worldwide developers. All transactions relate to U.S. consumer transactions.

Exhibit 27

[redacted]

Sources: Monthly App Revenue Data.

218. [redacted][499] and therefore distributing an app via a browser is not a substitute for distributing native mobile apps on Android.

5. Implementing the Hypothetical Monopolist Test

219. To understand whether Google operates the Google Play Store in a two-sided market, I apply the framework set out in Sections V.A and V.B above. The Google Play Store is a platform that matches both developers (who need to distribute apps) and consumers (who need to obtain their apps). The more high-quality apps that are available for download on Google Play Store, the more attractive the Play Store is to consumers. [redacted]

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[499] Google, [redacted] GOOG-PLAY-001882239.R-299.R, at 298.R.

[redacted][500] Thus, I conclude that, based on the definitions described above, Google operates the Play Store in a two-sided market.

220. As a result of my above observations that Google is operating a two-sided market, the hypothetical monopolist test for Android App Distribution would need to be modified to analyze whether a hypothetical monopolist of Android App Distribution could profitability impose a SSNIP on both consumers and developers together.

221. From a developer perspective, the price paid by developers is the commission Google charges in the but-for world absent the challenged conduct. As presented in Section VII.B.2, my estimate of Google's but-for commission charged to developers for app distribution is approximately 15%. Therefore, a conservative 10% increase in this commission amounts to 16.5 percentage points.

222. From a consumer perspective, while Google does not charge consumers a separate fee for using the Google Play Store, Google has recently introduced Google Play Points, which "rewards users for any purchase they make on Play — including apps, games, in-app items, music, movies, books, and subscriptions - and for downloading select apps and games" and lets participants use points to get discount coupons, in-app items, or Google Play Credit (see Section IV.A.6).[501] The points system is tiered, allowing users who collect enough points in a calendar year to "level up," earning the user even more points and benefits.[502] In the U.S., users earn "1 point for

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[500] *See* Email from Hiroshi Lockheimer, Senior Vice President of Platforms & Ecosystems for Google, to Stephanie Saad Cuthbertson, Google, "Subject: Re: android monetization," April 17, 2015, GOOG-PLAY-000813755-756, at 755 [redacted]").

[501] *See* Schoon, Ben, "Google Play Points rewards program goes official, only works in Japan for now," *9to5Google*, September 18, 2018, available at https://9to5google.com/2018/09/18/google-play-points-official-rewards-program-japan/. However, Google Play Store only expanded to the U.S. in 2019. *See also* Feng, Paul, "Introducing Google Play Points in the U.S.," *Android Developers*, November 4, 2019, available at https://android-developers.googleblog.com/2019/11/introducing-google-play-points-in-us html and Join Google Play Points.

[502] *See* Join Google Play Points.

every $1 USD [they] spend with Google Play."[503] Google Play Points functions as a form of negative price that rewards consumers for their purchases via the Google Play Store. Therefore, I model the price paid by consumers as the Google Play Points (or other direct discounts to consumers) that Google would have offered in the but-for world – 0.69%.[504] I note that the proper implementation requires the but-for price of the hypothetical monopolist. However, in my view, Google's but-for Play Points (and other discounts) is a lower bound on the discount the hypothetical monopolist would provide.

223. In conducting my SSNIP analysis, I start by asking whether the market is broader than App Distribution and In-App Billing Services on Android. This is because I would like to understand whether potential competitive constraints, such as the Apple App Store, act as a sufficient constraint on a hypothetical monopolist that controls both markets (as Google currently does). Therefore, I ask whether a hypothetical monopolist of both markets would find it profitable to impose a 10% SSNIP on both Android App Distribution and Android In-App Billing Services combined. To be clear, this does not mean that Android App Distribution and Android In-App Billing Services on Android are in one broad market. As stated in the *U.S. Merger Guidelines*: "The hypothetical monopolist test ensures that markets are not defined too narrowly, but it does not lead to a single relevant market."[505] To understand whether a SSNIP of 10% on developers and consumers would have been profitable for a hypothetical monopolist of both markets, I adapt my damages model as described in Appendix F.

224. Intuitively, there are two effects from a hypothetical monopolist imposing a SSNIP of 10%. First, the hypothetical monopolist reduces the discount to consumers (*i.e.,* the number of Play Points). This reduces consumer demand for apps and in-app content, making it less profitable for developers to create new apps and enter the combined market, thereby reducing the variety of apps in the combined market. Second, the hypothetical monopolist increases the commission to developers, decreasing the number of apps (*i.e.,* the variety) and increasing the prices for developers

[503] *See* Join Google Play Points.
[504] *See* Rysman Workpapers.
[505] U.S. Merger Guidelines, § 4.1.1.

that remain set for their apps and in-app content. As a result of the indirect network effects, consumer demand for apps and in-app content falls.

225. The details of my calibration are explained in Section IX.D and also set out in detail in Appendix F. In short, the SSNIP of 10% will be profitable when the following condition is satisfied:

$$C \geq \frac{\epsilon_{Q,p}(1.1\,\tau^* - 0.9t_B^*)p^{**} - \frac{[(1.1\tau^* - 0.9t_B^*)p^{**} - (\tau^* - t_B^*)p^*]p^*}{p^{**} - p^*}}{\epsilon_{Q,p}}$$

[E. 15]

226. Where C is the hypothetical monopolist's marginal cost per transaction (same for both initial app download and in-app transaction), τ^* is the competitive commission for Android App Distribution and Android In-App Billing Services on which the hypothetical monopolist imposes the SSNIP (15%), t_B^* is the but-for Google's discount rate including Play Points offered to consumers [redacted] p^* is the but-for price of app/in-app content, p^{**} is but-for price after SSNIP is imposed, and $\epsilon_{Q,p}$ is the percentage change in the equilibrium number of transactions divided by the percentage change in equilibrium prices as a result of the SSNIP [redacted][506]

227. The prices, p^* and p^{**}, and the parameter $\epsilon_{Q,p}$, are solved for and calibrated using my damages model adapted for SSNIP analysis. The prices are determined in equilibrium as a result of competition between a large number of apps. The parameter $\epsilon_{Q,p}$ accounts for the supply and demand forces discussed above.

228. The right-hand side of E.15 provides a critical threshold for the marginal cost for hypothetical monopolist such that SSNIP is profitable if marginal cost is larger than the critical threshold. The critical threshold is calibrated as the following:

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[506] The calibration is detailed in the Appendix F. *See* Rysman Workpapers.

Exhibit 28

[redacted]

Sources:
1. Google Transaction Data.
2. Google Monthly App Revenue Data.

229. Plugging in the calibrated parameters, the Equation E.15 yields:

[redacted]

230. The result means that the 10% SSNIP is profitable when the hypothetical monopolist's marginal cost is greater than or equal to [redacted] Thus, any positive marginal cost would satisfy the SSNIP test. According to Google's internal documents, Google incurs costs to provide the Google Play Store (including both app distribution and in-app billing services). These include:

- [redacted][507] Additional documents note

[507] Google, "Play Cost of Payments," September 9, 2014, GOOG-PLAY-003764714.R-746.R, at 715.R-720.R.

[redacted][509]

- [redacted].[510]
- [redacted][511]

231. Therefore, given these costs are positive, I conclude that Google must face at least some positive marginal costs to provide the Google Play Store. Subsequently, marginal cost is almost certainly greater than the 10% SSNIP marginal cost threshold of [redacted] as noted above. Therefore, in my view, the 10% combined SSNIP on the Android App Distribution and Android In-App Billing Services Markets is profitable and thus the combined market does not include any constraints from outside the Android App Distribution or In-App Billing Services markets (such as the Apple App Store and associated billing services).

6. *Geographic Market*

232. I conclude that the relevant geographic dimension to this market is worldwide (excluding China).[512] As noted in Section IV.B.2, [redacted][513] Given availability and popularity in most parts of the world, Android developers who want to distribute their Android apps can reach a global audience no matter which country the developers are based in. Further, as explained by Huawei: "Generally

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[508] Google, "Project [redacted] – Potential Evolutions," July 2, 2021, GOOG-PLAY-007819776-064, at 876.

[509] [redacted]. *See* Google, "Play Finance Overview," November 2017, GOOG-PLAY-000613152.R-249.R, at 162.R and 180.R.

[510] Google, "Play Finance Overview," November 2017, GOOG-PLAY-000613152-249.R at 162.R.

[511] Google, "Play Finance Overview," November 2017, GOOG-PLAY-000613152-249.R at 162.R

[512] *See* Google, "Partnerships," GOOG-PLAY4-002169674-679, at 675 [redacted] April 4, 2013, GOOG-PLAY-004253884-960, at 894 [redacted]

[513] Kolotouros (Google) Deposition, p. 450 [redacted] and EC Google Android Decision, ¶ 415 and FN 409.

speaking, competition takes place at a worldwide level because this is at that level that most of the apps in the appstore compete. For instance, customers in the UK and USA will download the same version of gaming applications, such as Angry Birds. Some of applications like news-related ones may compete at a regional level, but their number is limited."[514] In internal documents, [redacted]"[515] As noted in a Google internal document, [redacted][516] Some of Google's larger app distribution competitors (*e.g.*, Samsung and F-Droid) are also based outside the United States.[517]

233. The relevant geographic market excludes China, where the Google Play Store is unavailable (as are most other Google apps, such as Google Search, Google Maps, and YouTube).[518] Instead, the most popular Android app stores in China were developed by Chinese companies (*e.g.*, the Tencent My App, 360 Mobile Assistant, and Baidu Mobile Assistant).[519] These app stores have no significant presence outside of China, because Chinese OEMs pre-install the Google Play Store on all devices that are sold outside of China (*e.g.*, Huawei, Lenovo, or Xiaomi).[520]

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234. Based on the evidence presented above, I find the Android App Distribution Market worldwide excluding China is a relevant antitrust market. I find that the Android App Distribution

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[514] EC Google Android Decision, ¶¶ 412-415.

[515] Google, "Google Play Competitive Usage Survey," GOOG-PLAY-001886111.R-166.R, at 118.R.

[516] Google, "App Stores on Android 12," February 2021, GOOG-PLAY-006814475.R-497.R, at 477.R.

[517] Aptoide, "The game-changing alternative Android app store," available at https://en.aptoide.com/company/about-us and Bondarenko, Peter, "Samsung," *Britannica*, October 1, 2021, available at https://www.britannica.com/topic/Samsung-Electronics.

[518] D'Onfro, Jillian, "Google is missing out on billions of dollars by not having an app store in China, new data shows," *CNBC,* January 17, 2018, available at https://www.cnbc.com/2018/01/17/google-misses-out-on-billions-in-china html and Comparitech, "Is Google blocked in China?" available at available at https://www.comparitech.com/privacy-security-tools/blockedinchina/google/.

[519] Kuhns, Todd, "The Top 15 App Stores In China," *AppInChina*, June 24, 2022, available at https://www.appinchina.co/blog/the-top-15-app-stores-in-china/.

[520] EC Google Android Decision, ¶¶ 10 and 417-419.

Market includes Android app stores and sideloading while the substitution and constraint from more remote alternatives, such as the Apple App Store, PC app stores, and gaming console app stores, are not sufficient to include them in the relevant market.

D. Android In-App Billing Services Market is a Relevant Market

235. The second relevant antitrust market related to Google's alleged conduct is the Android In-App Billing Services Market. As discussed in Section III.D, developers who monetize in-app content require a billing service provider to receive payment and authorize the unlocking of the purchased in-app content.[521] The Android In-App Billing Service provider is a vendor to the developer, who requires In-App Billing Services to complete Android smart mobile device users' purchases of in-app content (as well as being part of the experience that the app provides).

236. My analysis of the Android In-App Billing Services Market proceeds as follows in seven parts. *First*, I summarize the basic functionality of products in the Android In-App Billing Services Market, including Google Play Billing. *Second*, I explain how in-app billing services are separate from Android App Distribution, and how Google Play Billing is a separate and distinct product from the Google Play Store. *Third*, I determine that the Android In-App Billing Services Market is a one-sided market between developers (as buyers) and Android In-App Billing Services providers (as sellers). *Fourth*, with those considerations in mind, I apply the HMT to define the boundaries of the Android In-App Billing Services Market. *Fifth*, I consider potential alternative market definitions for the Android In-App Billing Services Market. *Finally*, I define the geographic market as worldwide excluding China.

237. I conclude that the Android In-App Billing Services Market consists of: (i) Google Play Billing; (ii) developers' own billing service systems; and (iii) independent billing service providers.

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[521] Dubrova, Daria, "How to integrate payment systems into the existing app," *The App Solutions*, available at https://theappsolutions.com/blog/development/payment-systems-for-the-app/.

1. The Function of Android In-App Billing Services and Google Play Billing

238. As described in Section III.D, Android in-app billing services consist of a bundle of complementary services, which includes receiving payment and authorizing the unlocking of the purchased in-app content[522] and may also include invoicing, payment history, and refund processing.[523] [redacted][525] As part of this seamless experience, a payment gateway works as a virtual terminal at checkout to encrypt customers' credit card information/payment credentials and pass them to payment processors, which then pass a consumer's payment data to an issuing bank, collect funds from the card-issuing

[522] Xsolla, for example, is an online payment gateway that connects to credit cards networks (*e.g.*, Visa), integrated billing service providers (*e.g.*, PayPal), and payment systems (*e.g.*, Apple Pay and Google Pay). *See* Xsolla, "Pay Station," available at https://xsolla.com/products/paystation and Xsolla, "Grant Purchases to User," available at https://developers.xsolla.com/solutions/web-shop/catalog-and-items/grant-purchases/. As another example, Zuora is a payment processor specializing in subscription billing services. *See* Zuora, "Billing Software," available at https://www.zuora.com/products/billing-software/.

[523] For example, Amazon's In-App Purchasing API performs the following workflow: "logic to display the purchasable item,"; "perform the purchase,"; "handle any preconditions or error scenarios." It does not offer refunds on purchases of in-app items or track consumers' purchases. *See* Amazon Appstore, "In-App Purchasing Overview," May 18, 2022, available at https://developer.amazon.com/docs/in-app-purchasing/iap-overview html.

[524] Samat (Google) Deposition, pp. 470-471 [redacted]). *See also* Samsung, "What is Samsung In-App Purchase?" available at https://developer.samsung.com/iap/overview.html.

[525] Chu (Meta Platforms (formerly Google)) Deposition, p. 259 ("[redacted].

bank, and transfer the funds to the merchant's account after deducting a fee.[526] Exhibit 30Exhibit 30 illustrates the process of enabling the purchase of in-app digital content.

239. Different app stores and different independent payment service providers offer (or are poised to offer) the full suite of in-app billing services or different elements of the billing services bundle within this market. I describe the options available to Android app developers below.

a) Android In-App Billing Services Offered by Android App Stores

240. Some Android app stores offer Android In-App Billing Services that include the SDK or API specific to that billing system. The Amazon Appstore describes the In-App Billing Services it provides with its "In-App Purchasing API" vs. what developers must provide for themselves as shown in Exhibit 29 below.

[526] *See*, *e.g.*, Dublino, Jennier, "Payment Gateway vs. Payment Processor," *business.com*, September 20, 2022, available at https://www.business.com/articles/payment-gateway-vs-payment-processor/.

Exhibit 29
Amazon Appstore In-App Purchasing API Responsibility

The following table summarizes the separation of responsibility between your app and the Amazon Appstore when implementing IAP:

Responsibility	Your App	Amazon
Presents the catalog of in-app items to the customer for purchase.	✔	
Unlocks purchasable functionality.	✔	
Manages the purchase flow.		✔
Performs payment processing.		✔
Handles secure communication with the Amazon platform, including payment security.		✔
Verifies entitlements and validates purchase receipts.	✔	✔
Manages billing for auto-renewing subscriptions.		✔
Manages billing for revoking of entitlements.		✔
Verifies receipts for subscriptions and entitlements before providing content to user.	✔	
Downloads remotely delivered content.	✔	
Displays and uses downloaded digital goods.	✔	
Tracks customer purchases and consumable inventory.	✔	
Note: Amazon offers no refunds on purchases of in-app items.		

Source: Amazon, "In-App Purchasing Overview," available at https://developer.amazon.com/docs/in-app-purchasing/iap-overview.html.

241. Amazon explains that its in-app billing API provides "purchase dialogs, transaction timeout logic, [and] 'Thank You' dialogs" during the digital in-app content purchase flow.[527] For

[527] Amazon, "In-App Purchasing Overview," available at https://developer.amazon.com/docs/in-app-purchasing/iap-overview.html.

situations where the in-app content is downloaded to the user device as part of the original app download, the Amazon Appstore in-app billing API works in the steps shown in Exhibit 30 below.

Exhibit 30
Amazon Appstore In-App Purchasing API Steps

Step	Compo nent	Task
Step 1	App	App launches the in-app purchase flow. App invokes IAP API to manage the purchase.
Step 2	IAP API	IAP API interacts with the user to complete the purchase. IAP API returns a purchase receipt to the App.
Step 3	App	App uses the receipt to unlock the purchased local content.

Source: Amazon, "In-App Purchasing Overview," available at https://developer.amazon.com/docs/in-app-purchasing/iap-overview.html.

242. Similarly, Samsung offers "Samsung In-App Purchase" for apps published on the Samsung Galaxy Store.[528] Samsung In-App Purchase includes "an SDK and Server APIs," which "enable [developers] to easily integrate IAP functionality into [an] app, such as configuring IAP, getting item details, offering and selling items, and managing purchased items," as well as "verify[ing] item purchases, creat[ing] a service token, and check[ing] subscription status."[529] Samsung explains that the first step for developers using Samsung In-App Purchase is to "[d]ownload the Samsung In-App Purchase SDK and integrate it into your application."[530] The functionality of the Samsung IAP SDK is shown in Exhibit 31 below:

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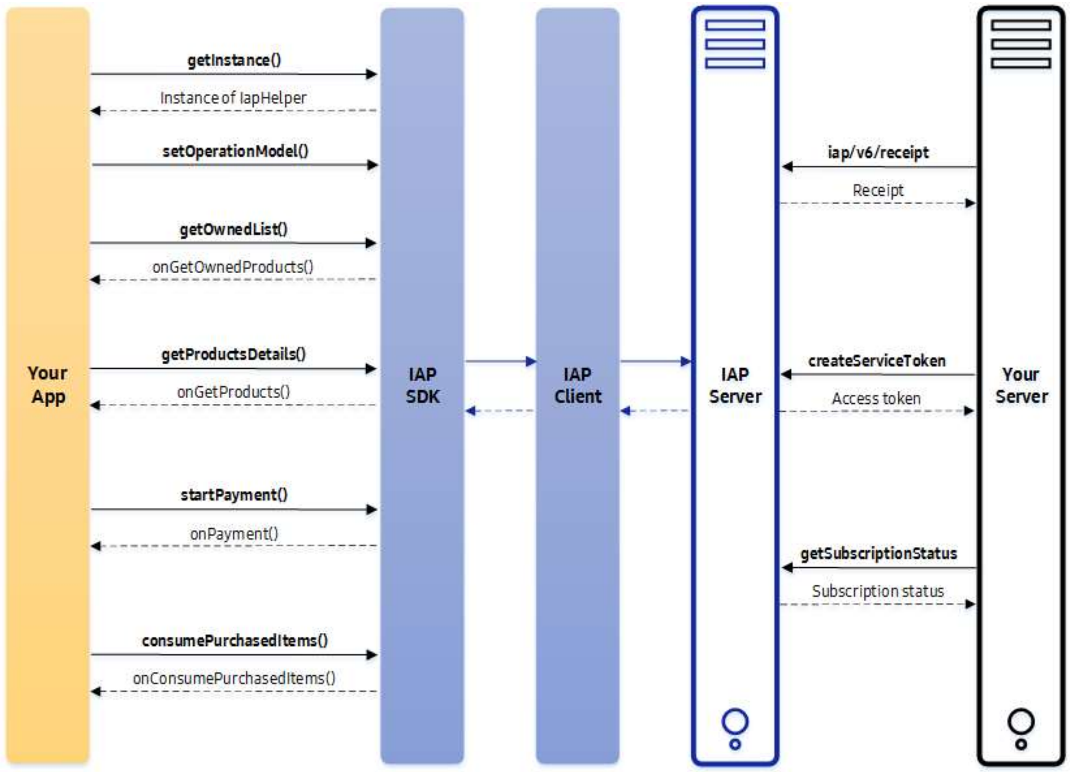
[528] Samsung, "What is Samsung In-App Purchase?" available at https://developer.samsung.com/iap/overview.html.
[529] Samsung, "What is Samsung In-App Purchase?" available at https://developer.samsung.com/iap/overview.html.
[530] Samsung, "What is Samsung In-App Purchase?" available at https://developer.samsung.com/iap/overview.html.

Exhibit 31
Samsung Galaxy Store In-App Purchasing SDK

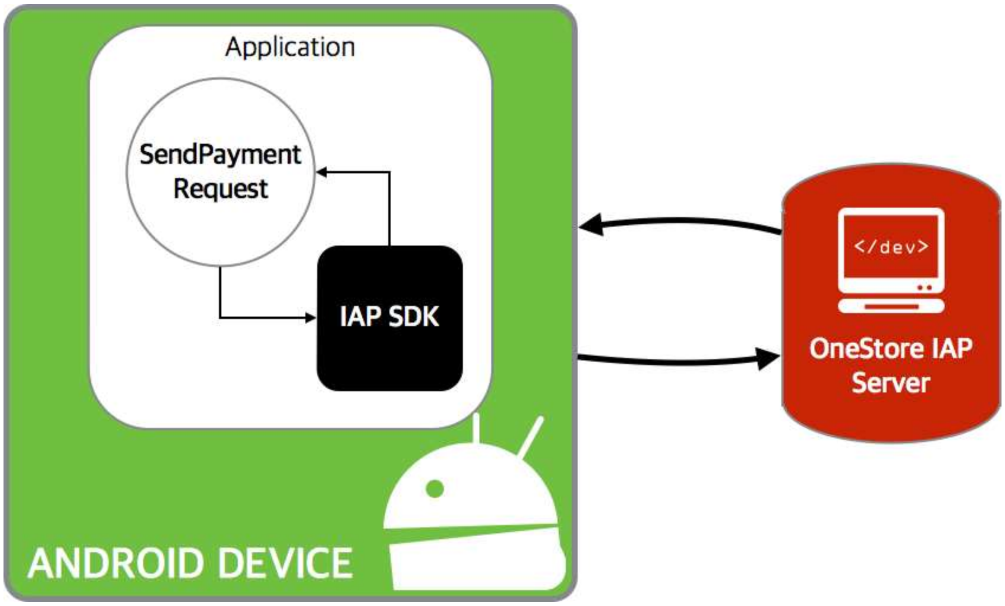


Source: Samsung, "What is Samsung In-App Purchase?," available at https://developer.samsung.com/iap/overview.html.

243. The ONE store also offers an in-app billing services API. ONE store explains that the in-app billing services functionality does not come as part of the store itself; rather, an "IAP module" must be "applied to [the] developer's app," and that module "is provided as [a] Java development library, which is called IAP SDK (In-App Purchase Software Development Kit)."[531] ONE store illustrates this as shown in Exhibit 32 below:

[531] GitHub, "What is ONE store In-App Purchase?" available at https://github.com/ONE-store/inapp-sdk-eng.

Exhibit 32
ONE Store In-App Purchasing SDK



Source: GitHub, "What is ONE store In-App Purchase?" available at https://github.com/ONE-store/inapp-sdk-eng.

244. As explained in Section III.D, Google Play Billing is Google's billing service, which provides a bundle of at least four services that allows developers to sell digital content through their Android apps: [redacted] and (4) refund services for some credit card transactions made and then cancelled within 48 hours from purchase.[532] With respect to subscriptions for in-app content, Google also gives developers a tool for subscription management.[533] I understand that Google Play Billing does not include general customer service, refund services after 48 hours from purchase, any

[532] Loew (Google) Deposition, p. 48, 55-60, 93-99, and 193; Google Play Help, "Learn about refunds on Google Play," available at https://support.google.com/googleplay/answer/2479637?hl=en-GB#:~:text=Your%20Play%20Pass%20subscription%20can,month%20in%20which%20you%20cancelled ("It's less been than 48 hours since you bought an app or made an in-app purchase: you can request a refund through Google Play.").

[533] Google, "Create and manage subscriptions," available at https://support.google.com/googleplay/android-developer/answer/140504?hl=en.

content delivery, or any digital wallet services such as Google Pay (see Section III.D). As Mr. Koh testified, [redacted][534]

b) Alternative Android In-App Billing Services Available to Developers

245. Absent Google's requirement that developers use Google Play Billing, app developers would also be able to develop their own Android in-app billing services, use third-party in-app billing service providers for the entire bundle of in-app billing services, or combine some elements from each.[535] Because certain purchases of digital goods (as well as purchases of physical goods sold via Android apps distributed through Google Play Store, which are not subject to Google's contractual restrictions,[536] [redacted]

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[534] Koh (EA (formerly Google)) Deposition, pp. 382-383 [redacted].

[535] Google, "Understanding Google Play's payments policy – Frequently asked questions," available at https://support.google.com/googleplay/android-developer/answer/10281818?hl=en-GB#zippy=%2Ccan-i-offer-a-consumption-only-reader-app-on-google-play ("Purchases of digital goods or services that can only be consumed outside of a Play-distributed app and cannot be accessed in a Play-distributed app do not require Google Play's billing system").

[536] Google, "Google Play Payments Policy," available at https://support.google.com/googleplay/android-developer/answer/9858738; Google, "Understanding Google Play's payments policy – Frequently asked questions," available at https://support.google.com/googleplay/android-developer/answer/10281818?hl=en-GB#zippy=%2Ccan-i-offer-a-consumption-only-reader-app-on-google-play ("Google Play allows any app to be consumption-only, even if it is part of a paid service. For example, a user could log in when the app opens and access content paid for somewhere else"); Google, "Play Billing Policy," August 2019, GOOG-PLAY-003334312-347, at 314; and Google, "Understanding Google Play's Payments policy," available at https://support.google.com/googleplay/android-developer/answer/10281818?hl=en#:~:text=Starting%20on%20June%201%2C%202022,payments%20landscape%20in%20the%20country ("In 2020, we clarified the language in our Payments policy to be more explicit that all developers selling digital goods and services in their apps are required to use Google Play's billing system. Apps using an alternative in-app billing system will need to remove it in order to comply with the Payments policy … Starting June 1, 2022, any app that is still not compliant will be removed from Google Play").

[redacted][537]) [redacted][538]

246. Some prominent developers handle in-app billing services in-house. For example, [redacted][542] Additionally, Epic Games announced its own in-app billing system in 2020.[543]

247. Some developers subcontract aspects of Android In-App Billing Services—including the SDK or APIs—to standalone payments entities that do not have app stores. Square, for example, offers a variety of payments products, including point-of-sale systems for retailers and restaurants.[544] In 2019, Square launched an "In-App Payments SDK" for multiple mobile OSs,

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[537] *See*, *e.g.*, Loew (Google) Deposition, p. 199 [redacted]).

[538] *See* Lockheimer Deposition, p.83 [redacted]

[539] Rasanen (formerly Google) Deposition, p. 307 [redacted]

[540] Rosenberg (Google) Deposition, p. 269 [redacted]

[541] Lim (Google) Deposition, pp. 505-506 [redacted]

[542] Google, [redacted] August 2019, GOOG-PLAY-002438751-754, at 753 [redacted] Google, [redacted] December 2020, GOOG-PLAY-006997722-751, at 723 [redacted]; and Google, [redacted]" January 2021, GOOG-PLAY-006817773.R-890.R, at 853.R [redacted]

[543] The Fortnite Team, "Announcing Epic Direct Payment on Mobile," *Epic Games*, August 13, 2020, available at https://www.epicgames.com/fortnite/en-US/news/announcing-epic-direct-payment-on-mobile.

[544] Square, "A point of sale for however you sell," available at https://squareup.com/us/en/point-of-sale.

including Android.[545] The app developer using Square's solution must integrate the In-App Payment SDK with their app, which then "captures payment information and returns a valid payment token."[546] The app then interfaces with the "Square Payments API, which accepts the payment token and sends the create payment requests to Square."[547] Square warns its developer customers that "using the In-App Payments SDK to process digital sales might not be allowed by some mobile application distribution services (such as App Store and Google Play) and might result in your application being removed" from those app stores by running afoul of their requirements to use only the app store billing system for in-app payments.[548]

248. In summary, Google's policy of mandating that developers distributing apps via the Google Play Store use Google Play Billing has meant that 97% of developers that have sold digital content on the Google Play Store use Google Play Billing.[549] However, there are many in-house (*i.e.*, developing their own API) or third-party solutions that are more cost effective or entail billing features that are specific to the app.[550] [redacted]

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[545] Square, "Square Launches Payments SDK, Enabling Developers To Process Payments With Square In Their Mobile Apps," January 9, 2019, available at https://squareup.com/us/en/press/payments-sdk ("'With the introduction of in-app mobile payments to the Square platform, developers now have a complete, omnichannel payments solution for all their payment needs,' said Carl Perry, Developer Lead at Square. 'From software to hardware to services, Square offers a complete payments experience all in one cohesive open platform[.']").

[546] Square, "In-App Payments SDK Overview," available at https://developer.squareup.com/docs/in-app-payments-sdk/what-it-does.

[547] Square, "In-App Payments SDK Overview," available at https://developer.squareup.com/docs/in-app-payments-sdk/what-it-does.

[548] Square, Build on Android, https://developer.squareup.com/docs/in-app-payments-sdk/build-on-android, available at See also Samsung, "What is Samsung In-App Purchase?" available at https://developer.samsung.com/iap/overview.html.

[549] Samat, Sameer, "Listening to Developer Feedback to Improve Google Play," *Android Developers*, September 28, 2020, available at https://android-developers.googleblog.com/2020/09/listening-to-developer-feedback-to html.

[550] *See* "Stipulation and [Proposed] Order on Match's Motion for Temporary Restraining Order," *Match Group, LLC, et al.* v. *Google LLC, et al.*, the United States District Court for the Northern District of California San Francisco Division, Case No. 3:22-cv-02746-JD, May 19, 2022 (hereafter "Match Stipulation"), at ¶ 3 ("Match agrees to work in good faith on further enabling Google's Play's billing system as an option for users of its apps so long as Google agrees to work in good faith to continue to develop additional billing system features that are important to Match.") and "Joint Stipulation and [Proposed] Order Regarding Epic Games, INC.'s Request for Preliminary Relief," *Epic Games, Inc. v. Google LLC et al.,* the United States District Court for the Northern District of California San Francisco Division, Case No. 3:20-cv-05671-JD, May 20, 2022 (hereafter "Bandcamp Stipulation"), ¶¶ 2-4.

[redacted][552]

249. Absent Google's conduct, developers would therefore be incentivized to substitute to these alternatives to Google Play Billing – because they would capture the revenue that flows to Google by virtue of its requirement that developers use Google Play Billing. The evidence therefore suggests that Google Play Billing, developers' own transactions service systems, and third-party billing services should all be included in the Android In-App Billing Services Market.

2. Google Play Billing and Android In-App Billing Services Are Products Separate and Distinct from Android App Distribution

250. Counsel has instructed me to consider the question of whether demand for Android In-App Billing Services exists separately from the demand for Android App Distribution. The economic evidence shows that it does. Developers can and do select Android In-App Billing Services from independent in-app billing service providers or develop their own in-app billing service solutions. Further, some Android app stores do not mandate their own in-app billing services but instead offer multiple options to developers.

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[551] Declaration of Peter Foster in Support of Plaintiffs Match Group, LLC's, Humor Rainbow, Inc.'s, Plentyoffish Media ULC's, And People Media, Inc.'s Motion for Temporary Restraining Order, May 10, 2022 (hereafter "Foster Declaration"), ¶ 75.

[552] Foster Declaration, ¶¶ 76-83.

251. Additionally, Android App Distribution and In-App Billing Services are not substitutes. Consumers, whose in-app purchases drive developers' demand for In-App Billing Services, cannot obtain in-app content without first downloading the app. Thus, from a consumer perspective, in-app purchases and app distribution are complements. From a developer perspective, while it is possible to change the way they generate revenue from their apps (*e.g.,* an upfront/fixed cost for an app vs. a free app with in-app transactions), developers cannot abandon app distribution entirely. Naturally, the developer requires the app to be downloaded before the developer can sell any in-app content for which it requires In-App Billing Services.

a) When Given a Choice, Developers Select Android In-App Billing Services from Independent Service Providers or Develop Their Own Solutions

252. As described in Section IV.B.2, Google requires almost all Android developers to use Google Play Billing for digital in-app transactions associated with apps downloaded from the Google Play Store. However, as described in Section V.D.1 above, technologically this need not be the case.[553] As further described in Section V.D.1 above, absent Google's requirement that developers use Google Play Billing, app developers would be able to choose their own billing service providers, either by providing some of those services themselves or by using independent billing service providers.[554]

[553] [redacted] *See* Google, "Billing Integration for Android Market," GOOG-PLAY-005653612.R-617.R, at 617.R.

[554] *See*, *e.g.*, Google, "Understanding Google Play's payments policy – Frequently asked questions," available at https://support.google.com/googleplay/android-developer/answer/10281818?hl=en-GB#zippy=%2Cdoes-your-billing-policy-change-depending-on-my-app-category%2Cdoes-the-requirement-to-use-google-plays-billing-system-apply-to-purchases-of-goods-or-services-that-cant-be-used-within-the-app ("Purchases of digital goods or services that can only be consumed outside of a Play-distributed app and cannot be accessed in a Play-distributed app do not require Google Play's billing system.").

253. [redacted][555] Despite Google's attempts to mandate the use of Google Play Billing for purchases of digital goods through an app downloaded from the Google Play Store, Google's agreement with developers meant it could not remove, de-list or refuse to list an app, even if that developer's app offered in-app purchases through means others than Google Play Billing, or that developers did not pay fees to Google on in-app purchases made through other means than Google Play Billing.[556] Google allowed an exemption from its policies for "digital content or goods that may be consumed outside of the application itself (*e.g.*, buying songs that can be played on other music players)."[557] [redacted][558] [redacted][559] Recognizing that developers understood its policy permitted them to use their own billing systems in certain instances, Google clarified the policy on September 28, 2020, "to be more explicit that all developers selling digital goods and services in their apps are required to use Google Play's billing system. Apps using an alternative in-app billing system will need to remove it in order to comply

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[555] Koh (EA (formerly Google)) Deposition, p 183 [redacted]; and Email from Paul Feng, Product Management Director for Google, to Kristin Reinke, Google, [redacted] February 1, 2019, GOOG-PLAY-000259276-279, at 276 [redacted]); Rasanen (Google) Deposition, p. 129 ([redacted].

[556] *See*, *e.g.*, Match Stipulation, ¶ 1 .

[557] *See*, "Google Play Developer Program Policies," Google Play via Wayback Machine captured on August 1, 2012, available at https://web.archive.org/web/20120801104115/https:/play.google.com/about/developer-content-policy.html.

[558] *See, e.g.*, Rosenberg Deposition, pp. 262-264 ([redacted]

[559] Google, "Play Payments Policy," June 17, 2020, GOOG-PLAY-001018461.R-468.R, at 464.R.

with the Payments policy."[560] [redacted],[561] [redacted][562]

254. [redacted][563] [redacted][564]

255. Google executives have recognized that developers may want to offer their own billing solutions, which could lead to a cascading effect. [redacted]

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[560] Google, "Understanding Google Play's Payments policy," available at https://support.google.com/googleplay/android-developer/answer/10281818?hl=en and Ahmed, Arooj, "Google Has Finally Announced the Change in the Billing Policies of Play Store Apps," *Digital Information World*, September 30, 2020, available at https://www.digitalinformationworld.com/2020/09/google-has-finally-announced-the-change-in-the-billing-policies-of-play-store-apps.html#:~:text=On%2028%20September%2C%20Google%20officially,rarely%20use%20Google%27s%20billing%20system.

[561] *See* Google, "Play Billing Policy," August 2019, GOOG-PLAY-003334312-347, at 314; Google, GOOG-PLAY-004702879-881, at 879; and Google, "Updates to Google Play Policies," available at https://support.google.com/googleplay/android-developer/answer/9934569#zippy=%2Csummary-of-changes%2Cjanuary.

[562] *See* Google, GOOG-PLAY-004702879, at 879 ([redacted]

[563] Google, "Play Billing Policy," August 2019, GOOG-PLAY-003334312-347, at 316. Match Group withdrew its request for a temporary restraining order against Google on the basis that Google allows additional in-app payment mechanisms in its app. *See* Match Stipulation, ¶ 8; Email from Brandon Barras, Google, to Sameer Samat, Vice President of Product Management for Google, [redacted] June 27, 2017, GOOG-PLAY-000840773-782, at 779 [redacted] and Google, [redacted] August 2019, GOOG-PLAY-002438751-754, at 753 [redacted]

[564] Google, [redacted] June 11, 2020, GOOG-PLAY-000416238-244, at 243 and Google, "[redacted] GOOG-PLAY-002618277-278, at 277. [redacted] *See* Email from Jamie Rosenberg, Vice President of Strategy and Operations (Platforms and Ecosystems Division) for Google, to Sundar Pichai, Google, [redacted] October 5, 2014, GOOG-PLAY-000077271-273, at 272. *See also* Google, [redacted] GOOG-PLAY-001088593-601, at 593-596.

[redacted][565]

256. [redacted][566] [redacted][567] [redacted]

[565] Email from Sam Tolomei, Play Apps Business Development Manager at Google, to Paul Feng, Director of Product Management for Google Play, [redacted] May 1, 2019, GOOG-PLAY-000259640-647, at 643 and Google, "[redacted] GOOG-PLAY-006829073.R-172.R, at 085.R.

[566] Google, [redacted] January 26, 2009, GOOG-PLAY-004630018.R-032.R, at 025.R; Google, [redacted] April 14, 2021, GOOG-PLAY-006829073.R-172.R at 083.R [redacted]

[567] Email from Michael Marchak, Director of Play Partnerships, Strategy and Operations at Google, to Joshua O'Connor, Google, [redacted] May 14, 2019, GOOG-PLAY-000934804-805, at 804.

Exhibit 33

[redacted]

Source: Google, [redacted] July 27, 2020, GOOG-PLAY-004692994.R-017.R, at 998.R.

[redacted]

568 Google, [redacted] November 16, 2020, GOOG-PLAY-007337179-213, at 181 and 183.

258. In addition, ONE store in South Korea charges a 20% commission for in-app digital purchases and further reduces the commission to 5% for developers who use their own billing systems.[569]

259. Second, the similar costs between third-party billing service providers and Google Play Billing suggest they belong to the same relevant product market. [redacted][570] Exhibit 34 below from Google's internal document illustrates this point.

Exhibit 34

[redacted]

[569] Na, Hyun-joon and Minu, Kim, "Korean app market One Store vows to go global in 2022 with more popular games," *Pulse*, August 24, 2021, available at https://pulsenews.co.kr/view.php?year=2021&no=816068.

[570] Google, [redacted] April 14, 2021, GOOG-PLAY-006829073.R-172.R at 081.R. See also, Email from Greg Funk, Google, to Samer Sayigh, Google, [redacted] February 9, 2018, GOOG-PLAY-000258450-450, at 450.

Source: Google, [redacted] 4/8 discussion, GOOG-PLAY-006829073.R-172.R, at 081.R.

b) Android App Stores Do Not Always Include Mandatory Android In-App Billing Services

260. Indirect evidence of demand also shows that the Google Play Store and Google Play Billing are separate products because Android app stores—including the Google Play Store itself—have not always bundled that app store's Android in-app billing services as a condition of Android App Distribution. For example, Android Market (the precursor to the Google Play Store), which launched in 2008, did not offer in-app billing services until 2011.[571] [redacted][572] The Epic Games Store also offers a proprietary payment system for in-app purchases but does not mandate its use.[573]

261. Over time, Google has monitored which developers are not complying with its Google Play Billing policies, and, in instances in which app developers have not been fully compliant (*i.e.,* they adopted alternative payment methods for digital in-app purchases), Google has informed such developers to comply with its rules and transition to Google Play Billing for digital in-app purchases. [redacted]

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[571] Google, "Android Market: Now available for users," October 22, 2008, available at https://android-developers.googleblog.com/2008/10/android-market-now-available-for-users.html and Chu, Eric, "In-app Billing Launched on Android Market," *Android Developers*, March 29, 2011, available at https://android-developers.googleblog.com/2011/03/in-app-billing-launched-on-android html#:~:text=Today%2C%20we%27re%20pleased%20to,purchases%20from%20within%20your%20apps.

[572] Google, [redacted]" Q1 2019, GOOG-PLAY-001139437.R-531.R, at 460.R-469.R.

[573] CMA Final Report on Mobile Ecosystems, ¶ 4.205 and Appendix H, ¶ 24 and Valentine, Rebekah, "Epic Games Store implements in-game purchases for third-parties," *Gamesindustry.biz*, December 6, 2019, available at https://www.gamesindustry.biz/articles/2019-12-06-epic-games-store-implements-in-game-purchases-for-third-parties ("The Epic Games Store has updated its policy to allow its third-party developers and publishers to implement in-game purchases within their titles on the store. Developers and publishers can either use Epic-provided payment services or set up their own functionality. If they opt for the latter, they will not need to share any revenue with Epic on in-game transactions.").

[redacted][574] [redacted][578]

262. In November 2021, Google announced a program in South Korea in response to legislation requiring that Google allow developers to offer an "alternative in-app billing system, alongside Google Play's billing system, for their mobile and tablet users in South Korea."[579] Google has taken similar steps in the European Economic Area.[580] [redacted]

[574] *See* Google, "Play Policy Feedback," November 8, 2017, GOOG-PLAY-000442329-350, at 329-343.

[575] Google, "Billing Policy Compliance," January 2021, GOOG-PLAY-006817773.R-890.R, at 776.R-777.R, 838.R, and 867.R-868.R.

[576] Google, "Billing Policy Compliance," January 2021, GOOG-PLAY-006817773.R-890.R, at 861.R.

[577] Google, "Billing Policy Compliance," January 2021, GOOG-PLAY-006817773.R-890.R, at 833.R.

[578] *See* Google, "GPB Policy Compliance Tracker Dashboard," GOOG-PLAY-002291709.R-715.R, at 710.R.

[579] White, Wilson, "Enabling alternative billing systems for users in South Korea," Google, November 4, 2021, available at https://developers-kr.googleblog.com/2021/11/enabling-alternative-billing-in-korea-en.html.

[580] Werth, Estelle, "An update on Google Play billing in the EEA," *Google*, July 19, 2022, available at https://blog.google/around-the-globe/google-europe/an-update-on-google-play-billing-in-the-eea/ ("This will mean developers of non-gaming apps can offer their users in the EEA an alternative to Google Play's billing system when they are paying for digital content and services. . . . . When a consumer uses an alternative billing system, the service fee the developer pays will be reduced by 3%. Since 99% of developers currently qualify for a service fee of 15% or less, those developers would pay a service fee of 12% or lower based on transactions through alternative billing for EEA users acquired through the Play platform").

[redacted].[581] [redacted][582]

263. Further, Google has more recently explored decoupling Google Play Billing from purchases of digital content via apps downloaded from the Google Play Store. On March 23, 2022, Google announced User Choice Billing, a pilot program that would "allow a small number of participating developers to offer an additional billing option next to Google Play's billing system."[583] The first developer partner in the program is Spotify.[584] [redacted][585]

264. Finally, Google currently only requires the use of Google Play Billing for purchases of digital content, not for purchases of physical goods or services (e.g., ride-share purchases).[586]

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[581] Rosenberg (Google) Deposition, p. 100 [redacted]

[582] Google, [redacted] December 2020, GOOG-PLAY-006997722-751, at 725.

[583] Samat, Sameer, "Exploring User Choice Billing with First Innovation Partner Spotify," *Android Developers*, March 23, 2022, available at https://android-developers.googleblog.com/2022/03/user-choice-billing.html.

[584] Samat, Sameer, "Exploring User Choice Billing with First Innovation Partner Spotify," *Android Developers*, March 23, 2022, available at https://android-developers.googleblog.com/2022/03/user-choice-billing.html and Google, "Spotify – Google Play Better Together Program Partnership ('Program') Addendum to the Google Play Developer Distribution Agreement," November 17, 2020, GOOG-PLAY-011250116-166, at 116-119.

[585] *See, e.g.,* Loew (Google) Deposition, p. 199 [redacted].

[586] Google makes exceptions to its 30% commission for purchases that "must not" use Google Play Billing. *See* Google, "Google Play Payments Policy," available at https://support.google.com/googleplay/android-developer/answer/9858738 and Google, "Understanding Google Play's payments policy – Frequently asked questions," available at https://support.google.com/googleplay/android-developer/answer/10281818?hl=en-GB#zippy=%2Ccan-i-offer-a-consumption-only-reader-app-on-google-play. ("Google Play allows any app to be consumption-only, even if it is part of a paid service. For example, a user could log in when the app opens and access content paid for somewhere else").

Developers selling physical goods and services to be consumed outside apps through Android apps can choose from several existing billing service providers with much lower commissions [redacted] or they can implement their own solutions. As presented in Exhibit 8 in Section III.D, [redacted]

265. [redacted][587] [redacted][588] [redacted]

266. Thus, from both a demand and supply perspective, Android In-App Billing Services for the purchase of digital in-app content is a separate and distinct product from Android App Distribution.

3. Android In-App Billing Services is a One-Sided Market Between Developers and Service Providers

267. Indirect network effects are not important for the developer as purchaser of Android in-app billing services because the value to the developer of the billing services does not change based on the number of buyers in the market. [redacted]

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[587] Google, [redacted]" September 2017, GOOG-PLAY-002405918.R-947.R, at 925.R; and Feng (Google) Deposition, p. 285 [redacted] Loew (Google) Deposition pp. 192-193 ([redacted]

[588] Google [redacted] September 2017, GOOG-PLAY-002405918.R-947.R, at 921.R; Google, [redacted] June 2018, GOOG-PLAY-001264185-191, at 189 [redacted] and Feng (Google) Deposition, p. 438.

[redacted][589] here the developer's choice of billing service provider is independent of how many other parties may be using that same provider. Rather, the choice depends on criteria such as fees and the consumer experience provided. The billing service provider is therefore a vendor to the developer, who purchases this billing service as an input to the in-app content product sold to users (as well as being part of the experience that the app provides to consumers, *i.e.*, a low-friction purchase process that is seamless for the user).

268. In addition, there is no platform intermediary between the developer and the Android in-app billing services provider that controls their relationship. Billing service providers control their own prices, which developers contract for and pay.[590] This suggests that the Android In-App Billing Services Market is one-sided.

269. Finally, the output of Android in-app billing services is agnostic to price structure, which also suggests a one-sided market. Unlike an app store, which can charge higher prices to developers in order to subsidize negative prices to consumers, Android in-app billing services providers do not incentivize consumers in the same way. [redacted][591] When Google does not foreclose rivals from the market, Android In-App Billing Service providers offer pricing incentives and quality of service solely to win sales to developers.

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[589] Email from Hiroshi Lockheimer, Senior Vice President of Platforms and Ecosystems for Google, to Stephanie Saad Cuthbertson, Google, "Subject: Re: android monetization," GOOG-PLAY-000813755-756, at 755 [redacted]

[590] Stripe offers a pay-as-you-go pricing schedule for developers without setup fees, monthly fees, or hidden charges. *See*, for example, Stripe, "Pricing," available at https://stripe.com/pricing.

[591] Loew (Google) Deposition pp. 49 and 86 [redacted]

270. Therefore, as an economic matter, I analyze the Android In-App Billing Services Market as a traditional one-sided market involving Android app developers and billing service providers.[592]

4. Alternative Relevant Markets for In-App Billing Services

271. I also consider whether Apple's in-app billing or exiting an app to complete a payment transaction should be included in the relevant market. I conclude that neither should be included in the relevant antitrust market for Android In-App Billing Services.

272. Apple's in-app billing system is not an option for Android developers. As discussed above, Apple's in-app billing system is embedded exclusively into iOS apps distributed on the Apple App Store.[593] [redacted].[594] Developers who want to distribute their apps for Android, therefore, cannot use Apple's in-app billing system.

273. Billing service options that require exiting the Android app to complete a purchase, while possible, are not a sufficient competitive constraint on Google Play Billing. [redacted][595]

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[592] Note that this market does not include all developers, as some developers do not monetize their in-app content, choosing to either monetizing the initial purchase of the app, or providing the app for free – perhaps as a service to an existing customer base (*e.g.*, a banking app), or monetizing their app in other ways (*e.g.*, through advertising).

[593] Apple operates its own proprietary in-app billing service—"In-app purchase." *See* Apple, "In-app purchase," available at https://developer.apple.com/in-app-purchase/. [redacted]

[594] Brady (Google) Deposition, p. 72 [redacted]

[595] Pasquali, Marina, "Main reasons why consumers in the United States abandoned their orders during the checkout process in the United States in 2022," *Statista*, June 24, 2022, available at https://www.statista.com/statistics/1228452/reasons-for-abandonments-during-checkout-united-states/ https://www.statista.com/statistics/1228452/reasons-for-abandonments-during-checkout-united-states/; Alzetta

Similar to the impact of frictions on app distribution described in Section V.B.2, because seamless payments are an important input into an app's user experience, frictions that discount the user experience likely lead to consumers abandoning in-app purchases that cannot be completed within the app, as recognized in academic literature on frictions.[596] [redacted].[597] [redacted][598] [redacted][599]

274. Moreover, payment methods by means of hyperlinks, websites, and even cash are not embeddable into apps and will likely cause interruptions to the user experience.[600] [redacted]

[redacted]

[596] Transaction convenience, especially the speed and ease with which consumers complete transactions, is an important component of consumers' shopping experience. *See* Seiders, Kathleen, Leonard L. Berry, and Larry G. Gresham, "Attention, retailers! How convenient is your convenience strategy?" *Sloan Management Review,* Vol. 41, No. 3, 2000, pp. 79-89, at p. 87.

[597] Lim (Google) Deposition, pp. 258-259 [redacted]; Google, [redacted] April 30, 2020, GOOG-PLAY-004691145-146, at 145 [redacted]; and Google, [redacted] GOOG-PLAY-007628059-070 at 065. [redacted] *See* Google, [redacted]" August 29, 2019, GOOG-PLAY-001283119-123, at 120 and Google, [redacted] May 26, 2021, GOOG-PLAY-007745035-079, at 036-040.

[598] Google, [redacted] GOOG-PLAY-000942553.R-586.R, at 570.R.

[599] Chu (Google) Deposition, p. 259.

[600] Perez, Sarah, "Google to allow users to pay for Android apps using cash," *Tech Crunch,* May 8, 2019, available at https://techcrunch.com/2019/05/08/google-to-allow-users-to-pay-for-android-apps-using-cash/.

[redacted][601]
For these reasons, I exclude hyperlinks/websites that direct consumers outside of the app for processing payments or options to pay with cash from the Android In-App Billing Services Market.

5. *Geographic Market*

275. The relevant geographic market for the Android In-App Billing Services Market is worldwide excluding China. First, billing service providers offer their services worldwide. The Google Play Store distributes apps on Android OS in over 135 countries around the world.[602] Therefore, Google Play Billing, tied to the Play Store, is used by Android developers worldwide for transactions related to in-app digital content, in the countries where it is available. [redacted][603] Moreover, concerns related to the exclusive use of Google Play Billing as well as Google's 30% commission are seen in

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[601] Google, [redacted] December 18, 2017, GOOG-PLAY4-002610426-439, at 431. [redacted] *See* Google, [redacted] August 2020, GOOG-PLAY-005578403.R-450.R, at 410.R; and "Defendant Google LLC, Google Ireland Limited, Google Commerce LTD, Google Asia Pacific PTE. LTD. And Google Payment Corp.'s Responses and Objections to Match's First Set of Interrogatories to Defendants, *Match Group LLC. et al. v. Google LLC et al.*, the United States District Court Northern District of California San Francisco Division, Case No. 3:21-md-02981-JD, July 27, 2022, p. 20 [redacted].

[602] Android Developers, "Google Play Billing," available at https://developer.android.com/distribute/play-billing.

[603] Email from Andrew Zaeske, Director of Engineering for Google, to Eric Chu, Engineering Director for Meta Platforms and former Director of the Android Developer Ecosystem for Google, "[redacted] June 6-7, 2020, GOOG-PLAY-000051084-088, at 087.

countries such as South Korea and India.[604] In addition, competing billing service providers such as Adyen, PayPal, and Stripe, offer their services in a worldwide market.[605]

276. Second, China is excluded from the Android In-App Billing Services geographic market because it has a distinct market for in-app billing services given that the Google Play Billing APIs that come as part of GMS are inaccessible in China to date (setting aside piracy of Google apps and APIs).[606] [redacted]"[607] The different operators in the Chinese market include WeChat Pay and Alipay, which are not supported by app stores outside China.[608] Therefore, I find that China should be excluded from the geographic market for Android In-App Billing Services.

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277. Based on the evidence presented above, I find the Android In-App Billing Services Market worldwide excluding China is a relevant antitrust market. The market for Android in-app transactions is separable from the market for Android App Distribution to the extent that third-party billing service providers and developers' own billing systems sufficiently meet developers' demand for Android in-app billing services and are considered as substitutes for Google Play Billing. I also find that Android in-app billing services are distinct from (i) Apple's in-app billing system, and (ii)

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[604] Singh, Manish, "Google delays mandating Play Store payments rule in India to April 2022," *Tech Crunch,* October 4, 2020, available at https://techcrunch.com/2020/10/04/google-policy-cut-india-paytm-mini-app-store/ and Perez, Sarah, "Google Play to support alternative billing systems in South Korea, following new law," *Tech Crunch,* November 4, 2021, available at https://techcrunch.com/2021/11/04/google-play-to-support-alternative-billing-systems-in-south-korea-following-new-law/.

[605] For example, Adyen is available in Europe, Mexico, Brazil, China, and Southeast Asia. PayPal is available globally in more than 200 countries/regions. Stripe operates in 47 countries. *See*, *e.g.*, Adyen, "Country guides," available at https://www.adyen.com/knowledge-hub/country-guides; PayPal, "We get where you're coming from," available at https://www.paypal.com/uk/webapps/mpp/country-worldwide#:~:text=We%20are%20available%20in%20more,over%20borders%20and%20language%20barriers; and Stripe, "In your country," available at https://stripe.com/global.

[606] Google, "Supported locations for distribution to Google Play users," available at https://support.google.com/googleplay/android-developer/answer/10532353?hl=en (As shown in the table, users in China "may not download paid apps. Attempts to make in-app purchases on Google Play will fail.").

[607] Email from Andy Dyer-Smith, Google, to Matt Goodridge, Google, [redacted] January 23, 2017, GOOG-PLAY-000976171-173, at 171.

[608] AppInChina, "Accepting Payments in China," available at https://www.appinchina.co/services/monetization/in-app-purchases/.

billing services via hyperlinks or websites, which, I find, are not viable alternatives. Further, billing service providers offer their services worldwide, with the exception of China where Google Play Billing is restricted and Chinese in-app billing service providers, who do not operate outside China, dominate.

VI. Google has Monopoly Power in the Relevant Antitrust Markets

278. I now turn to assessing whether Google has monopoly power—*i.e.*, sufficient market power to profitably impose durable prices that are higher (or equivalently, to reduce quality, choice, or innovation) than competitive levels and/or to exclude competition in the relevant antitrust markets identified above.

279. I understand from counsel that market power and monopoly power are two related but distinct terms under the law. U.S. antitrust authorities have defined market power as "the ability profitably to maintain prices above competitive levels for a significant period of time"[609] and monopoly power as "the long term ability to raise price or exclude competitors."[610] Economists do not recognize a qualitative distinction between market power and monopoly power. So-called "monopoly power" as the courts appear to define it would be referred to by economists as a very high degree of durable market power. I use the term "market power" in that sense for the sake of clarity in this report.

280. An evaluation of market power typically considers a firm's share of the relevant market and whether there are barriers to entry or expansion that limit the ability of potential entrants to discipline price. That is because a dominant market share alone does not reliably indicate that a firm's market power is tenable in the event of new entrants. Only with substantial barriers to entry

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[609] U.S. Department of Justice and the Federal Trade Commission, "Horizontal Merger Guidelines," April 8, 1997, available at https://www.justice.gov/atr/horizontal-merger-guidelines-0#N_6_, § 0.1.

[610] Federal Trade Commission, "Monopolization Defined," available at https://www ftc.gov/tips-advice/competition-guidance/guide-antitrust-laws/single-firm-conduct/monopolization-defined; *See also*, Fisher, Franklin, "Diagnosing Monopoly," *Journal of Reprints for Antitrust Law and Economics*, Vol. 27, 1997, p. 692 ("Monopoly power is the power to maintain a high share and earn supranormal profits without being better").

can one infer that a dominant firm has monopoly power and the ability to exercise it.[611] Additionally, any assessment of market or monopoly power should also consider any available direct evidence, *e.g.*, a "firm's price and output decisions," and "documentation of recognition of market power in a firm's price setting and other marketing decisions, coupled with the market's acceptance of those decisions, provides evidence of some market power."[612]

281. Based on my analysis detailed below, I find Google has monopoly power in Android App Distribution and Android In-App Billing Services.

A. Google has Monopoly Power in Android App Distribution

282. In this section, I provide both structural and direct evidence demonstrating Google has monopoly power in the Android App Distribution Market.

1. Google Imposes a Supracompetitive Commission on Google Play Store Purchases And Earns Extraordinarily High Profits

283. Google's monopoly power in Android App Distribution is demonstrated by Google's ability to impose a supracompetitive commission via the use of Google Play Billing on paid downloads in the Google Play Store (see Section VII.B). [redacted]

611 Fisher, Franklin, "Diagnosing Monopoly," *Journal of Reprints for Antitrust Law and Economics*, Vol. 27, 1997, p. 687 ("[T]he role of entry plays a major part in any assessment of monopoly power. Where entry is easy, no monopoly power can persist. Where entry is difficult, provided there are not already many competitors, monopoly power can survive… Clearly then, correct analysis of entry or barriers to entry lies at the heart of an assessment of monopoly power").

612 Schmalensee , Richard, "Another Look at Market Power," *Harvard Law Review*, Vol. 95, No. 8, 1982, pp. 1789-1816, at p. 1807; Baker, Jonathan B.and Timothy F. Bresnahan, "Economic Evidence in Antitrust: Defining Markets and Measuring Market Power," in *Handbook of Antitrust Economics*.

Exhibit 35

[redacted]

Note: The data includes worldwide developers. All transactions relate to U.S. consumer transactions.

Source: Google Transaction Data.

284. [redacted][613]

285. Google is able to charge this supracompetitive commission despite lower commissions offered by alternative Android app stores. For example, as described in Section V.D.2,the One store in Korea charges 20% (and only 5% if a developer chooses their own billing solution). That Google was able to maintain its supracompetitive commission in the Google Play Store despite lower commissions from alternative Android app stores over the same period is indicative of Google's monopoly power in Android App Distribution.

286. I note that starting on July 1, 2021, after or around the time of the commencement of related private and public enforcement actions such as this case, Google announced that "the service fee for each developer will be 15% for the first $1M (USD) of earnings" and 30% for earnings in excess of $1 million.[614] In a competitive market, prices are set in relation to marginal cost. I am unaware of any explanation by Google of how a reduction in the marginal cost of serving developers below the $1 million threshold drove this change. These special commission rates appear to be akin to price discrimination, which means pricing according to a customer's

[613] *See,* Google, [redacted] January 26, 2009, GOOG-PLAY-004630018.R-032.R, at 024.R; *See also* Google, Untitled, GOOG-PLAY-004506631-633, at 631. [redacted].

[614] *See,* Google, "Changes to Google Play's service fee in 2021," available at https://support.google.com/googleplay/android-developer/answer/10632485?hl=en.

willingness to pay.[615] It is widely accepted in economics that price discrimination can exist only if a firm has market power.[616] Thus, I find this change in commission rates does not demonstrate competition but instead demonstrates the reverse. Moreover, as depicted in Exhibit 36, using the Google transaction data, I find that [redacted] And, as noted in Exhibit 35 above, [redacted]

287. The fact that developers with elastic or low demand for the Google Play Store can negotiate lower rates does not mean that Google lacks market power or that competition in Android App Distribution is unnecessary. These deviations from the standard commission rate apply to a very small share of developers.

Exhibit 36

[redacted]

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[615] Google, [redacted] GOOG-PLAY-007329063-073, at 064 [redacted]

[616] *See,* Varian, Hal R, "Price discrimination," in *Handbook of Industrial Organization*, Vol 1, Eds. R. Schmalensee and R.D. Willig, Elsevier Science Publishers B.V., 1989, pp. 597-654, *available at* https://doi.org/10.1016/S1573-448X(89)01013-7.

Notes:
1. The data includes worldwide developers. All transactions relate to U.S. consumer transactions.
2. The commission rate is rounded to the nearest 1%. I further discuss the profitability of Google's commission in Section VI.C below.

Source: Google Transaction Data.

288. Additionally, a comparison of Google's commission in the Google Play Store to various competitive benchmarks illustrates that Google's commission on Android App Distribution through the Google Play Store is supracompetitive. In Section VII.B.3, I provide an analysis of commissions imposed by platforms that face competition, including the Microsoft Store, which imposes a 15% commission for apps and a 12% commission for games; the Epic Games Store, which imposes a 12% commission; and the Game Jolt store, which imposes a commission below 10%.[617,618] [redacted][619]

289. Further evidence of Google's market power in Android App Distribution comes from Google's change in revenue sharing with MNOs. As noted in Section IV.B.5 and further in Section

[617] *See e.g.,* Sardo, Giorgio, "Building a new, open Microsoft Store on Windows 11," June 24, 2021, available at https://blogs.windows.com/windowsexperience/2021/06/24/building-a-new-open-microsoft-store-on-windows-11/; Epic Games, "Frequently Asked Questions," available at https://store.epicgames.com/en-US/publish; "Revenue Split," available at https://gamejolt.com/marketplace. *See also* CMA Final Report on Mobile Ecosystems, ¶ 4.205.

[618] Google internally evaluated that changing to a 20% revenue-share will [redacted]" March 2019, GOOG-PLAY-000542516.R-535.R at 529.R.

[619] See Exhibit 35 and Exhibit 69.

VII.A.1, [redacted][621,622]below:

[620] *See,* Google, [redacted] May 6, 2015, GOOG-PLAY-001184813-857, at 824. *See also* Google, [redacted] October 2012, GOOG-PLAY-003772918.R-925.R, at 919.R ([redacted]

[621] *See e.g.* Google, [redacted] May 6, 2015, GOOG-PLAY-001184813 – 857, at 823 [redacted]. *See also* GOOG-PLAY4-004677224 – 229, at 225. *See also*, [redacted] Google and AT&T, [redacted] January 1, 2013, GOOG-PLAY-003604606-625; Google and AT&T, "Amendment Two To Google Play Revenue Share Agreement (Google Play For Mobile Operators)," February 1, 2015, GOOG-PLAY-003604601-604; [redacted] October 26, 2015, GOOG-PLAY-003605103-106; GOOG-PLAY4-002178049; Email from Matt Schwartz to Jamie Rosenberg, Vice President of Strategy and Operations (Platforms and Ecosystems Division) at Google, Zahavah Levine, Google, TT Ramgopal, Google, Christian Veer, Google, Paul Gennai, Product Management Director at Google, [redacted] GOOG-PLAY-002891881-882.

[622] Feb. 15, 2022 letter from B. Rocca to M. Coolidge [redacted] *See* Google Transaction Data. *See* Rysman Workpapers.

Exhibit 37

[redacted]

Note: The data includes worldwide developers. All transactions relate to U.S. consumer transactions.

Source: Google Transaction Data.

290. [redacted][623]

[623] PX1098, Email from Jon Gold to Cristina Bita, GOOG-PLAY-003741416, at -417; PX1091, Email from Jon Gold to Jon Gold, GOOG-PLAY-003762336 [redacted]

2. *High Margins are Indicative of Market Power*

291. This evidence of the Google Play Store's supracompetitive commission rates should be viewed alongside evidence of Google Play Store's very high profit margins. As noted above, in economics, a firm's market power is the ability to consistently raise price profitably above marginal cost (or alternatively the competitive level). In highly competitive markets price will tend to be driven towards marginal cost, so a firm sustaining price above the competitive level / marginal cost must have some market power.[624] Therefore, very high profit margins may indicate that a firm is exercising a high degree of market power.

292. Lerner (1934) proposed a price-cost margin index for measuring market power, noting that for a profit maximizing firm, the index is equal to the inverse of a firm's price elasticity of demand.[625] This makes it explicit that the more inelastic the demand for its product, the greater a firm's price-cost margin, and therefore the greater a firm's market power.

293. One way to see why profit margins are a reliable measure for market power is to consider what happens to margins as a market moves from perfect competition towards monopoly. Under perfect competition, price equals marginal cost and firms earn zero profits and hence have zero economic profit margins. As competition becomes weaker (*e.g.,* the number of firms in a market decreases), profit margins increase for firms in the market because they face less competitive pressure and become more able to raise prices above competitive levels.

294. Profit margins can also convey more information about market power than market shares or elasticities alone. When a firm profit maximizes, the profit margin can be shown to be a function of market elasticity of demand, rival firms' elasticity of supply, and market share of the firm.[626] Each of these components affects the profit margin in an intuitive manner – profit margins

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[624] Landes, William M. and Richard A. Posner, "Market Power in Antitrust Cases," *Harvard Law Review*, Vol. 94, No. 5, 1981, pp. 937-996 (hereafter "Landes and Posner (1981)"), at pp. 937-939.

[625] In two-sided markets, the ability of a monopolist to price above its marginal cost is inversely related to the price elasticity of demand. *See* Jullien, Pavan & Rysman (2022), p.13. *See also,* Landes and Posner (1981), pp. 939-940. *See also*, Lerner, A.P., "The Concept of Monopoly and the Measurement of Monopoly Power," *The Review of Economic Studies*, Vol. 1, No. 3, 1934, pp. 157-175, at p. 169.

[626] *See* Kaplow, Louis, "Why (Ever) Define Markets?" *Harvard Law Review*, Vol. 124, No. 2, 2010, pp. 437-517 (hereafter "Kaplow (2010)"), at pp. 451-452.

increase with the firm's market share but decrease with the market elasticity of demand and rivals' elasticity of supply. Hence, a firm's profit margin is a measure of market power that can account for all three different factors that may affect a firm's ability to set prices consistently above competitive levels.

295. Google's supracompetitive commission generated high margins for Google. Google's profit and loss statements (P&L) for Google Play, Google's other internal documents, and testimony all show that Google Play has maintained high profit margins. [redacted].[628] [redacted][62][redacted] [redacted]

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[627] As discussed below, Google Play margins with ads are even higher.

[628] [redacted] *See* Rysman Workpapers.

[629] [redacted] *See* Defendants' Responses and Objections to State Plaintiffs' Second Set of RFAs, No. 20 [redacted]

Exhibit 38

[redacted]

Notes:

1. Gross and Operating Profit Margins were calculated by Google from 2015-2021. For earlier years, Google only calculates Gross Profits and Operating Profits. The Gross Profit Margins for those years are obtained by dividing Gross Profits (as calculated by Google), by Revenue. The Operating Profit Margins for those years are obtained by dividing Operating Profits (as calculated by Google), by Revenue.
2. Costs include all costs reported by Google in its Google Play P&L data.

Source: Google Play P&L Data, 2011-2021, PX428, GOOG-PLAY-000416245; GOOG-PLAY-010801682.

296. I have also looked at the operating profit margins for Play Store ads [redacted]

[630] *See* Google, [redacted] GOOG-PLAY-001090227 for 2018-2020 data; and GOOG-PLAY-010801680 for 2021 data. Note that these spreadsheets do not contain Google's calculations of operating profit

297. While accounting profits can deviate from economic profits and it is important to consider other evidence, I find that Google's high accounting margins are consistent with the other evidence I provide of Google's market power.

298. In addition to detailed P&L information, [redacted][631] [redacted]

margins. The spreadsheets contain revenue, total opex, and cost of sales data based on which I have estimated the margins as follows. [redacted]

[631] The exhibit is from a summary slide deck of P&L, prepared by Google in 2019 in the ordinary course of business. Google, "2019 Play P&L Review," July 2019, GOOG-PLAY-000559534.R-557.R, at 539.R; *See* Cramer (Google) Deposition, pp. 206-207.

Exhibit 39
Google Play Profitability

[redacted]

Source: Google, "2019 Play P&L Review," July 2019, GOOG-PLAY-000559534.R-557.R, at 539.R.

299. [redacted][632]

3. Structural Evidence Demonstrates Google has Monopoly Power

a) Google has a very high share of the Android App Distribution Market

300. As noted in the introduction to Section VI above, in practice, a high market share, coupled with barriers to entry, also may be evidence of monopoly power. In this section, I establish that no matter the method of measurement, the Google Play Store dominates the Android App Distribution Market at levels commonly associated with monopoly power. [redacted]

[632] Rosenberg (Google) Deposition, p. 399.

[redacted][634]

301. There are limited publicly available data on mobile app stores other than the Google Play Store and Apple App Store.[635] Firms that collect and produce publicly available data related to mobile app distribution generally fail to track alternative Android app stores, such as the Galaxy Store, Amazon Appstore, and F-Droid, thus indicating that such competitors are small and, by extension, that the Google Play Store is the dominant means of distributing Android mobile apps.

302. [redacted] The following measures are covered in further detail below: (i) overall share of Android app store installations; (ii) share of Android app store pre-installations (iii) shares of Android app downloads; (iv) shares of consumer expenditure on Android apps; and (v) shares in terms of user engagement with apps on their Android smart mobile devices, including visits to Android app stores and time spent on Android app stores.

303. **App Store Installations: 100%.** [redacted][637] In contrast, as summarized by the

[633] *See* Google, [redacted] GOOG-PLAY-001886111.R-166.R, at 118.R.

[634] *See* Google, [redacted] March, 2016, GOOG-PLAY-000299564-570 at 569.

[635] For example, Sensor Tower, a major provider of mobile app data and information, only track Apple App Store and Google Play Store. *See e.g.,* Sensor Tower, "2021 – 2025 Mobile Market Forecast," 2021.

[636] Google, "[redacted] GOOG-PLAY-001886111.R-166.R, at 112.R and 118.R; Google, [redacted] January, 2019, GOOG-PLAY-011111808-864, at 813.

[637] Google, [redacted] October 31, 2019, GOOG-PLAY-002076224.R-238.R, at 227.R.

[redacted]

Exhibit 40

[redacted]

Notes:

1. Shares are calculated as the total number of devices with the respective app store active divided by the total number of devices with the Play Store active, which approximately equals the number of Android smart mobile devices.
2. Data are yearly snapshots from December 31st (for 2015-2020) or July 1st (for 2021).

Source: GOOG-PLAY-010801683.

[redacted] The Google Play Store's substantial market power in terms of Android app downloads makes it an essential app store for OEMs to pre-install on their

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[638] *See* Google, "Android OC Quarterly Review—Q4 2010," October 12, 2010, GOOG-PLAY-001430401-442 at 412 [redacted] *See also* Google, "Play Global KOC Research," GOOG-PLAY-009245422-443 at 429.

Android smart mobile devices. This conclusion is consistent with the EC's findings of market shares in the Android App Distribution Market. Data on app store pre-installations on Android mobile devices (worldwide excluding China) from 2011 to 2016, show that the Google Play Store was pre-installed on 90-100% of all Android mobile devices over the same time period. No other Android app store was able to achieve a similarly high rate of pre-installations. [redacted][639]

305. **App Store Visits:** [redacted] OEMs can install their own app stores on their devices (subject to being paid not to do so by Google). [redacted][640] [redacted][644] The same analysis determined that the sum of users'

[639] *See,* EC Google Android Decision, ¶¶ 591-598.

[640] Google, "OEM App Store Share Analysis," October 31, 2019, GOOG-PLAY-002076224.R-238.R, at 227.R, 229.R and 230.R.

[641] Google, "OEM App Store Share Analysis," October 31, 2019, GOOG-PLAY-002076224.R-238.R, at 229.R-230.R.

[642] Google, "OEM App Store Share Analysis," October 31, 2019, GOOG-PLAY-002076224.R-238.R, at 229.R.

[643] Google, "OEM App Store Share Analysis," October 31, 2019, GOOG-PLAY-002076224.R-238.R, at 228.R.

[644] Google, "OEM App Store Share Analysis," October 31, 2019, GOOG-PLAY-002076224.R-238.R, at 229.R.

[redacted]

Exhibit 41

[redacted]

Source: Google, [redacted] October 31, 2019, GOOG-PLAY-002076224.R-238.R at 227.R, 229.R-231.R.

306. **Android App Downloads: 97%.** The Google Play Store has a high share of Android app downloads.[646] In 2020, 109 billion apps were downloaded from the Google Play Store worldwide (excluding China).[647] Based on available data, I estimate that the total number of non-

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[645] Google, [redacted] October 31, 2019, GOOG-PLAY-002076224.R-238.R, at 236.R.

[646] This conclusion is consistent with the EC's findings of market shares in the Android App Distribution Market. Data on apps downloaded via Android app stores (worldwide excluding China) from 2011 to 2016, show that 90-100% of all apps downloaded on Android devices were downloaded via the Google Play Store. All other Android app stores (including the Samsung Galaxy Store, Amazon Appstore, and Aptoide) achieved at most 10% collective market share over the same time period, with none individually achieving more than 5% (with the exception of Amazon in 2011 – [5-10%]). *See,* EC Google Android Decision, ¶¶ 591-598.

[647] In 2020, 34 billion apps were downloaded in the Apple App Store worldwide and 8.2 billion in China. Therefore, 25.8 billion apps were downloaded worldwide, excluding China. 109 billion apps were downloaded in the Google Play Store in 2020 worldwide, which excludes China. *See* Sensor Tower, "2021 – 2025 Mobile Market Forecast," 2021, pp.7 and 23.

Apple app downloads worldwide (excluding China) was around 112 billion.[648] Therefore, I calculate that the Google Play Store's share of non-Apple mobile app downloads worldwide (excluding China) in 2020 was approximately 97%.[649]

307. **Consumer Expenditure: 90%.** The Google Play Store has a high share of consumer expenditure on Android mobile apps. In 2020, consumer mobile app expenditures in the Google Play Store were $39 billion worldwide (excluding China).[650] During the same period, consumer mobile app expenditures in the Apple App Store were $52 billion worldwide (excluding China),[651] and total mobile app expenditures worldwide (excluding China) were around $95 billion.[652] Therefore, conservatively assuming that the portion of consumer mobile app expenditures not in the Google Play Store or the Apple App Store is spent in alternative Android app stores, I calculate that Google Play Store's share of Android consumer mobile app expenditures worldwide (excluding China) in 2020 is approximately 90% (=$39 billion / ($95 billion - $52 billion).[653]

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[648] The total number of app downloads in China was 96.2 billion in 2020. iOS's market share in China was around 20% in June 2020. Using a conservative estimate of 25%, the number of non-iOS app downloads in China would be 72 billion (equal to (100%-25%) of 96.2 billion). The total number of app downloads worldwide was 218 billion in 2020. Thus, the total number of non-iOS app downloads worldwide, excluding China, was 112 billion (equal to 218 billion minus 34 billion minus 72 billion). *See* Statista, "Market share of mobile operating systems in China from January 2013 to December 2021*," July 27, 2022, available at https://www.statista.com/statistics/262176/market-share-held-by-mobile-operating-systems-in-china/; Statista, "Number of mobile app downloads worldwide from 2016 to 2021," 2022, available at https://www.statista.com/statistics/271644/worldwide-free-and-paid-mobile-app-store-downloads/; Pawar, Pramod, "App Revenue Statistics 2022 – Mobile Games, iOS App, Android, Google Play," August 16, 2022, available at https://www.enterpriseappstoday.com/stats/app-revenue-statistics.html (citing Business of Apps, "App Data Report (2022)," 2022).

[649] 97% equals 109 billion divided by 112 billion.

[650] In 2020, consumer mobile apps expenditures on the Apple App Store were $72 billion worldwide and $20 billion in China. Therefore, Apple App Store expenditures were $52 billion worldwide (excluding China). Google Play Store expenditures in 2020 were $39 billion worldwide (excluding China). *See* Sensor Tower, "2021 – 2025 Mobile Market Forecast," 2021, pp. 6 and 22.

[651] In 2020, consumer mobile apps expenditures in the Apple App Store were $72 billion worldwide and $20 billion in China. Therefore, Apple App Store expenditures were $52 billion worldwide, excluding China. 2020 Google Play Store expenditures were $39 billion worldwide, which excludes China. *See* Sensor Tower, "2021 – 2025 Mobile Market Forecast," 2021, pp. 6 and 22.

[652] Total app revenue in 2020 was around $143 billion worldwide and around $48 billion in China. Therefore, total app revenue worldwide, excluding China, was around $95 billion in 2020. *See* Statista, "Worldwide consumer spending on mobile apps from 2016 to 2021," 2022, available at https://www.statista.com/statistics/870642/global-mobile-app-spend-consumer/; Stancheva, Terry, "17 App Revenue Statistics - Mobile Is Changing the Game in 2022," June 3, 2022, available at https://techjury net/blog/app-revenue-statistics/ (citing Business of Apps, "App Data Report (2022)," 2022).

[653] 89% equals $39 billion divided by $43.6 billion (the difference between $95.6 billion and $52 billion).

[redacted] Google's own assessments of the Play Store's market share in terms of user engagement are summarized in Exhibit 42 below.

Exhibit 42

[redacted]

Source: Google, "[redacted] October 31, 2019, GOOG-PLAY-002076224.R-238.R at 228.R, 229.R, 236.R.

309. The possibility of sideloading does not alter my views about Google's share of the market, or of its power in the market. Information on sideloading indicates that only a small share of apps are sideloaded. For example, according to the CMA's analysis of Google internal data for February 2022, fewer than 5% of app downloads occurred via sideloading or via app stores that were not pre-installed by the OEM.[657] As explained by Amazon, "consumers rarely download an

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[654] Google, "OEM App Store Share Analysis," October 31, 2019, GOOG-PLAY-002076224.R-238.R, at 236.R.

[655] Google, "OEM App Store Share Analysis," October 31, 2019, GOOG-PLAY-002076224.R-238.R, at 225.R.

[656] Google, "OEM App Store Share Analysis," October 31, 2019, GOOG-PLAY-002076224.R-238.R, at 236.R.

[657] *See* CMA Final Report on Mobile Ecosystems, ¶¶ 4.

app store onto their mobile device when another app store was pre-installed,"[658] and thus sideloading an alternative Android app store is unlikely to constrain Google's monopoly power in Android App Distribution. Data from Google further show that apps that were sideloaded or downloaded from app stores not pre-installed by an OEM are a small share of downloaded apps. In [redacted][659] In general, sideloading as a percentage of total app installations lies well under 20% for most countries, as summarized in Exhibit 43 below. Moreover, as I discussed in Section IV.B.4 and explain further in Section VII.A.2, Google has engaged in specific actions, such as a series of pop-up warnings including a message that a user could impact the security of their mobile device, that limits sideloading by Android users.

Exhibit 43

[redacted]

Source: Google, [redacted] October 7, 2016, GOOG-PLAY-000042623.R-639.R, at 632.R.

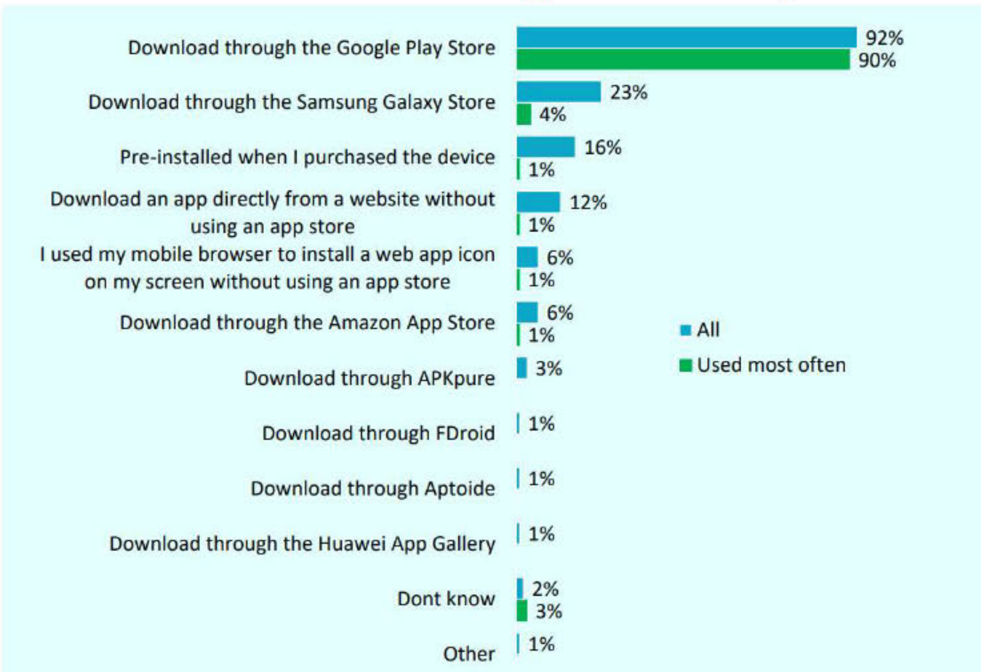
310. **Consumer Preference: 90%.** Given Google's advantages, it is unsurprising that a survey of consumers found that 90% of Android users downloaded apps through the Google Play Store most often, with only 4% using the Samsung Galaxy Store most often, 1% defaulting to the

[658] EC Google Android Decision, ¶ 636.

[659] *See*, Footnote 356.

pre-installed apps, 1% using sideloading, and 1% using the Amazon App Store most often.[660] While 23% of Android users had used the Samsung Galaxy store, only 6% had used the Amazon store, 3% APK pure, 1% FDroid, 1% Aptoide, and 1% through the Huawei Gallery.[661] This is shown in Exhibit 44 below.

Exhibit 44
How Android users Install Apps on their Smartphones



Source: CMA Consumer Survey, Figure 44.

311. **Number of Developers and Apps.** Moreover, given the importance of indirect network effects described in Section V.A.2 (the more apps available in an app store, the more attractive the app store is to users), the number of developers and apps available on the Google Play Store compared to alternative Android app stores should also be considered in evaluating Google's

[660] CMA Consumer Survey, Figure 44.

[661] CMA Consumer Survey, Figure 44.

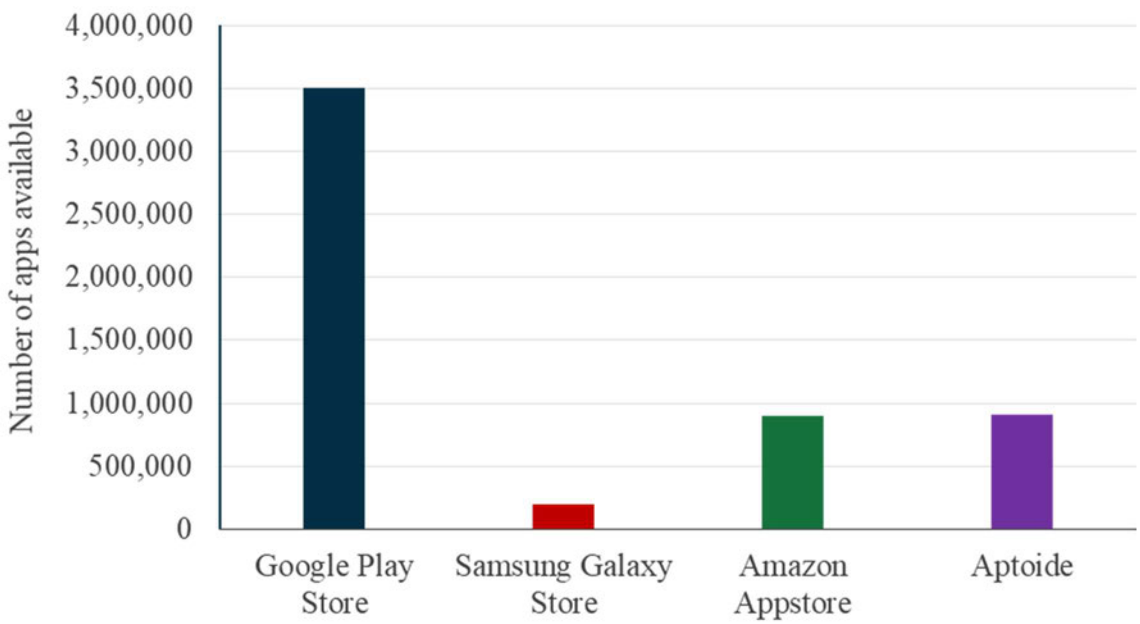
market power. [redacted][662]

312. As depicted in Exhibit 45, the number of apps available on the Google Play Store vastly outnumbers the number of apps on any other Android app store, which provides further structural evidence of Google's market power in Android App Distribution. At the end of 2017, the Google Play Store offered 3.5 million apps. By contrast, alternative Android app stores have vastly fewer number of apps available on their app stores. The Samsung Galaxy Store offered only 150,000-200,000 apps in March 2017, Amazon Appstore offered 700,00-900,000 apps in April 2017, and Aptoide offered 900,000 apps in June 2017.[663]

[662] *See* Google, [redacted] October 12, 2010, GOOG-PLAY-001430401-442 at 412 [redacted]. *See also* Google, "[redacted] GOOG-PLAY-009245422-443 at 429.

[663] EC Google Android Decision, ¶ 608.

Exhibit 45
Number of Apps Available on Android App Stores, 2017



Source: EC Google Android Decision, ¶ 608.

313. Moreover, there has been substantial growth in the number of apps available in the Google Play Store since Google's launch of Android Market, as depicted in Exhibit 46 below.

Exhibit 46

[redacted]

Notes:

1. Calculated as yearly averages based on the available monthly data from December 2009 to March 2022.
2. In summer 2018, Google removed a large amount of apps from its Google Play platform, mostly due to an updated version of the company's Developer Policy.

Sources:

1. Statista, "Number of available applications in the Google Play Store from December 2009 to March 2022," available at https://www.statista.com/statistics/266210/number-of-available-applications-in-the-google-play-store/.
2. Google [redacted] December 6, 2019, GOOG-PLAY-004775094-101, at 097.
3. Google, [redacted] February 1, 2019, GOOG-PLAY-008737003-016.

314. Given that the Google Play Store provides many more apps and reaches a much larger number of users than any alternative Android app store, the Google Play Store is the single most important distribution method for developers who wish to distribute their Android apps. Data demonstrate that far more developers publish apps on the Play Store than on competing Android app stores. For example, in 2017, there were 724,000 developers active on the Google Play Store

compared to just 69,000 on the Amazon Appstore.[664] A [redacted][65] Data from Google shows the number of developers selling apps or in-app content (in each year) on the Google Play Store, as depicted in Exhibit 47 below.

Exhibit 47

[redacted]

Source: Google Monthly App Revenue Data.

315. As stated by Samsung, developers "target" the Google Play Store as a distribution channel because it is "the indisputable market leader for Android apps, in both number of apps and number of users."[666] [redacted]

[664] Statista, "Total number of active mobile app developers in leading global app stores as of January 2017," January 27, 2022, available at https://www.statista.com/statistics/276437/developers-per-appstore/.

[665] *See,* email from Ricky Singla, Google, to Pat Correa, Google, "Subject: Re: Urgent: # of developers," October 4, 2018, GOOG-PLAY-000553664-666 at 664 [redacted]

[666] EC Google Android Decision, ¶ 611.

[redacted]

316. In summary, as shown in Exhibit 48 below, the evidence shows that Google has a high market share (on any metric) in the Android App Distribution Market.

Exhibit 48

[redacted]

Sources: bolded bullet points at the beginning of paragraphs 303-308;310; and 311.

317. However, as noted above, high shares alone are not sufficient to demonstrate monopoly power but must be reinforced with high barriers to entry. In the next section, I investigate whether there are high barriers to entry that protect these high shares.

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[667] *See* Google, "Android OC Quarterly Review—Q4 2010," October 12, 2010, GOOG-PLAY-001430401-442 at 412 [redacted] 009245422-443 at 429.

b) Substantial barriers to entry/expansion protect Google's market power

318. As I explain above, high market shares combined with barriers to entry or expansion can be indicative of monopoly power. As explored in Sections III and V, the Android App Distribution Market exhibits significant indirect network effects. The Google Play Store has an installed base of millions of apps and hundreds of millions of users that have already used the store to download apps. It dwarfs all other Android app stores in these respects. This makes it essential for OEMs to offer the Google Play Store pre-installed to their customers, and for app developers who want to reach the largest number of Android users. This virtuous cycle creates substantial barriers both to entry by new potential Android app stores and to expansion by existing app stores. This is well documented in the economics literature. For example:

- Kouris & Kleer (2012), note: "Developers can only make profits if there are users who would download and buy their apps. Hence, indirect network effects are relatively high. That causes the participants of the app market to converge to one platform. Once there is a clear leader, other platforms' chances to get enough customers diminish."[668]
- Vogelsang (2010), notes that when an incumbent firm reaches dominance: "economy of scale effects would be at work so that the threat of market entry of a new competitor is minimized and the monopolistic rents can be exploited: the economies of scale of the platform technology lead to declining average costs and increasing persistence of users to stay on the platform. Therefore, potential competitors will be deterred from entering."[669]
- Kouris (2013), also outlines four conditions that make "winner-take-all" more likely: "It is costly to multi-home – at least for one market side; There are high indirect network effects – at least for the side with high multi-homing costs; Same-side effects are not

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[668] Kouris, Iana and Rob Kleer, "Business Models in Two-Sided Markets: An Assessment of Strategies for App Platforms," 2012, available at https://aisel.aisnet.org/icmb2012/22/.

[669] Vogelsang, Michael. "Dynamics of two-sided internet markets," *International Economics and Economic Policy*, Vol. 7, Iss. 1, May 2010), 129-145, at p. 138.

negative and strong, that is, the congestion effect is not too high; The goods are rather homogeneous and there is no demand for differentiation."[670]

319. In addition, Google recognizes that:

- [redacted]
- [redacted]
- [redacted]
- [redacted][674]

320. [redacted][675]

321. The start-up costs of launching and expanding a competing Android app store are significant and likely to deter potential entrants. For example, Amazon states that it has "dedicated hundreds of employees and tens of millions of dollars each year over the course of several years to develop and commercialize its app store, including engineering, app store operations, business

[670] Kouris, I. "App platforms as two-sided markets: analysis and modeling of application distribution platforms for mobile devices" (2013), at p66.

[671] Google, [redacted] GOOG-PLAY-004508011-013, at 012.

[672] Google, [redacted] April 2017, GOOG-PLAY-000879194.R-224.R, at 207.R.

[673] Google, [redacted] April 2017, GOOG-PLAY-000879194.R-224.R, at 204.R.

[674] *See,* Google, [redacted] GOOG-PLAY-000443763-798, at 768-769.

[675] *See,* Google, [redacted] GOOG-PLAY-000443763-798, at 768-769.

development, developer and consumer marketing, developer relations and support."[676] For other firms, such as Sony, the costs that must be incurred to develop and maintain an app store that can compete with the Google Play Store have been "prohibitive."[677] Since Google's MADAs require OEMs to pre-install the Google Play Store in order to license its GMS suite of apps and APIs, new entrants would also need to invest in their own APIs to expand and fully compete with Google Play Store. [redacted][678] According to Aptoide, "[c]loning the entire GMS API stack (Maps, Messaging, Games, Billing…) implicates a[n] enormous [amount] of resources."[679]

322. [redacted][680] For example, Samsung contends it would "not be commercially feasible for an OEM to ship Android devices without Google Play pre-installed due to the variety and number of apps and contents available to users uniquely through the Google Play Store."[681] Similarly, Orange, a French multinational telecommunications provider, explained that the Google Play Store is currently a "must-have" on Android smartphones, pre-installing it "has become de facto mandatory,"[682] and, since Google Play Store "has no real competitors," it would be "very difficult to offer an app shop in competition with Google Play given (i) its link with Android OS and (ii) its current size."[683] [redacted]

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[676] EC Google Android Decision, ¶ 628.

[677] EC Google Android Decision, ¶ 628.

[678] Email from Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, to Wireless Biz, Google, [redacted] October 13, 2008, GOOG-PLAY4-000336290-293, at 291.

[679] EC Google Android Decision, ¶ 631.

[680] *See* email from John Yoo, Google, to Joshua O'Connor, Google, [redacted]" April 4, 2019, GOOG-PLAY-002115870-871 at 87[redacted]

[681] EC Google Android Decision, ¶ 600.

[682] EC Google Android Decision, ¶ 600

[683] EC Google Android Decision, ¶ 600.

[redacted][684]

323. While customers could in theory access their apps via several alternative Android app stores or via sideloading, according to Deutsche Telekom there are commercialization challenges from "significant network effects as well as developer and customer lock-in," which deter consumers from switching.[685] According to Opera, a Norwegian multinational technology company that offers both desktop and mobile browsers, Google "has established itself over the past few years as the default storefront for Android apps … Significant customer education and marketing investment would therefore be required to change this user perception with respect to an alternative app store."[686] By being "the de-facto standard Android app store," Google has an inherent advantage in the Android App Distribution Market.[687]

324. In addition, and as discussed in Section VII.A.1, [redacted][688] This would mean alternative "app stores struggle to gain traction because the pre-installed app store has the inbuilt advantage of being front and centre of the

[684] Kolotouros (Google) Deposition, p. 110.

[685] EC Google Android Decision, ¶ 629.

[686] EC Google Android Decision, ¶¶ 629-630. Opera is a web browser that competes with Google Chrome and Microsoft Edge etc. *See,* https://www.opera.com/about.

[687] EC Google Android Decision, ¶ 637. This finding is supported in academic literature. *See, e.g.*, Agarwal, R., & Gort, M., "First-mover advantage and the speed of competitive entry, 1887–1986," *The Journal of Law and Economics*, Vol. 44, No. 1, 2001, pp. 161-177, at pp. 164-166 ("[A]dvertising can increase brand-name recognition of first movers and hence impede entry."); Cubbin, J., "Advertising and the Theory of Entry Barriers," *Economica*, Vol. 48, No. 191, 1981, pp. 289–298, at pp. 290-291 ("Thus we have a prima facie case for the proposition that advertising may contribute to an entry barrier effect without any fundamental asymmetries in cost or demand functions."); Lieberman, M. B., & Montgomery, D. B., "First-Mover Advantages," *Strategic Management Journal*, Vol. 9, 1988, pp. 41–58, at p. 46 ("Psychology literature suggest[s] that the first product introduced received disproportionate attention in the consumer's mind. Late entrants must have a truly superior product, or else advertise more frequently (or more creatively) than the incumbent in order to be noticed by the consumer").

[688] Google, [redacted] February 24, 2021, GOOG-PLAY-003894142.R-177.R, at 172.R; Google, [redacted] February 2, 2018, GOOG-PLAY-001559464.R-496.R, at 478.R-479.R.

end user's experience when they first get their device."[689] The ability to exclude rivals is a hallmark of market power.

325. [redacted][690]

326. For these reasons, coupled with the existence of indirect network effects, which prevent developers from considering "any other Android app store as substitutable for the Google Play Store based on the ability to reach end consumers," it is "extremely difficult to establish a meaningful market segment share" for a potential new entrant.[691]

4. *Google's Market Power in Android App Distribution Faces Limited Competitive Constraints from Alternative App Distribution Systems*

327. As discussed in Section V.C.4 above, the Apple App Store does not provide a sufficient competitive constraint on the Google Play Store or other Android app distributors to be considered in the same relevant market. Because they operate in different markets, the Apple App Store does not constrain the Google Play Store. Further, non-Android app stores such as the Apple App Store do not exert competitive pressure on the Android App Distribution Market because (i) they do not function on Android smart mobile devices and (ii) Apple does not allow its mobile OS to be installed on non-Apple devices. As discussed in Section V.C.4, users show low propensity to switch to alternative mobile OSs due to the high costs of switching to a mobile device running an alternative OS. Moreover, developers view Android and non-Android app distribution channels as complements, rather than substitutes, and tend to multi-home by publishing their apps on both the

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[689] EC Google Android Decision, ¶ 636.

[690] See SectionVII.A.1. *See also* Google, [redacted] June 20, 2019, GOOG-PLAY4-004259430, at 432.

[691] This is the so-called chicken and egg problem: in order to attract developers, an app store should have a large base of users, who are willing to join only if a large base of developers write for that app store. *See* Jullien, Pavan & Rysman (2022), at pp. 17-18. *See also* Caillaud & Jullien (2003); EC Google Android Decision, ¶ 638.

Apple App Store and Google Play Store. Thus, the threat of switching to an Apple iOS device to access the Apple App Store will not constrain Google's behavior. I therefore find the relevant antitrust market to be a market for Android App Distribution, as explained above.

328. As described in Section V.C.4, most purchasers of smart mobile devices are already locked into their initial mobile ecosystem, as evidence suggests that a relatively small proportion of mobile device purchasers are buying their first smart mobile device. For example, worldwide smartphone penetration has steadily increased from just under 50% in 2016 to approximately 78% in 2020,[692] with rates even higher in developed nations. For example, a 2021 survey found that about 91% of households in the U.K. had smartphones.[693]

329. Given this very high rate of smart mobile device ownership, the significant constraint on Google's behavior will therefore need to come from existing mobile users (particularly as Google, Apple and/or the OEMs cannot discriminate between new and existing OS users). However, as described in Section V.C.4, these users are locked into the mobile ecosystem previously chosen, and, thus, switching costs and other barriers to switching smart mobile devices will drive Google's behavior in relation to the Google Play Store. As discussed in detail in Section V.C.4, mobile device users face significant costs when switching from Android to iOS. These include compatibility costs, transaction costs, the time to learn a new OS, uncertainty costs, among others. The existence of high switching costs naturally locks consumers into Google's Android ecosystem at the initial purchase of Android smart mobile devices, and as a result, the rate of switching between Android and iOS is quite low (see the evidence presented in Section V.C.4).

330. Further, most mobile device users single-home on either Android or iOS, with few users owning two or more devices covering both OSs. For example, survey evidence shows that 80% of users only have one smartphone, and even when users purchase another smartphone, it tends

[692] *See* Statista, "Global smartphone penetration rate as share of population from 2016 to 2020," August 11, 2022, available at https://www.statista.com/statistics/203734/global-smartphone-penetration-per-capita-since-2005/.

[693] *See* Ofcom, "Online Nation, 2021 Report," Figure 1.3, available at https://www.ofcom.org.uk/__data/assets/pdf_file/0013/220414/online-nation-2021-report.pdf.

to have the same OS.[694] As noted in Google's documents, for iPhone users who own tablets, [redacted] own iPads whereas [redacted] own Samsung tablets ([redacted] own both); for Android users who own tablets, at least [redacted] own a Samsung tablet with the iPad ownership rate at [redacted] for Pixel owners and [redacted] for Samsung owners.[695] The 2022 CMA Consumer Survey confirms the modest cross-ownership rate, showing that among Apple iPhone users, 63% owned an iPad, while only 7% owned an Android tablet.[696] For Android users, 36% also owned an Android tablet, while only 18% owned an iPad.[697] Similarly, evidence from app developers suggests only a small proportion of mobile device users access their apps from more than one OS.[698] That is consistent with evidence described earlier in the report (See Section V.C.4) that consumers do not switch, in part, because they are locked in to the Android or iPhone ecosystems and the hardware and software that is exclusive to the ecosystem they use. As set out in Section V.C.4, the Presser Survey found that 62% of respondents would worry that they might lose access to photos, phonebooks or other things they have on their devices, while between 71% and 78% said that switching to iPhone would take "some" effort or "a lot" of effort.[699]

331. Moreover, Android and Apple's iOS are two highly differentiated mobile ecosystems with distinct hardware and software, and smart mobile device pricing aimed at different target markets.[700] For example, in terms of software, Android smart mobile devices are pre-installed with the GMS suite of apps, including Google Search, Google Chrome, Google Play Store, etc., but

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[694] *See* CMA Final Report on Mobile Ecosystems, ¶3.39 and footnote 85.

[695] Google, "Consumption tablets," May 2019, GOOG-PLAY-000436340.R-406.R. at 383.R.

[696] See, CMA Customer Survey, Figure 21.

[697] See, CMA Customer Survey, Figure 21.

[698] *See,* CMA Final Report on Mobile Ecosystems, ¶3.40.

[699] Presser Report, p. 8.

[700] *See e.g.,* Cipriani, Jason, "Is there an alternative to Apple's ecosystem? Yes, but you'll have to Google it," *Zdnet,* May 1, 2019, available at https://www.zdnet.com/article/alternatives-to-apples-ecosystem-yes-there-is-a-way-out/.

Android can also provide different software experiences (*i.e.*, an Android 'skin'[701]) depending on which OEM is selling the Android mobile device.[702] By contrast, iOS smart mobile devices are equipped with Apple's proprietary native apps such as iMessage, Facetime, and Safari, and Apple only offers a single concurrent version of iOS with a lack of customization (See Section V.C.4), whereas Android offers more choice in terms of software experience. In terms of hardware, Apple iPhones use Apple's own propriety processor (*e.g.*, the iPhone 13 series uses the A15 Bionic[703]) and, similar to software, offer relatively limited customizations (*e.g.*, size etc.), while Android smart mobile devices offer a plethora of different hardware and software combinations across many different OEMs.[704] These differences in hardware and software experiences and customization often attract different types of customers.[705]

332. Further, mobile device pricing for Android and iOS smart mobile devices are generally targeted at different segments of the price spectrum. To examine this, I have analyzed IDC data on the prices and quantity sold of Android and iOS smartphones (*i.e.*, excluding tablets) from 2017 until 2021 (worldwide excluding China). This analysis, depicted in Exhibit 49 below, demonstrates that Android focuses heavily on the lower priced smartphone segment, with more than 80% of Android smartphones sold for under $300, whereas Apple iPhone sales are concentrated above $600, with more than 50% of iPhone sales between $600 and $1,000. This is despite Apple's attempts to move into the mid-tier price brackets with its iPhone SE in 2016 (priced as low as

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[701] "Android skins are software tweaks that live on top of stock Android. They often look very different and offer features that other skins don't. In other words, underneath all the additional design and functionality tweaks, the core version of Android is on all Android devices. To add some brand identity though, some manufacturers craft an experience that's truly unique to their lines of phones. Others leave well enough alone and barely touch how Android functions." *See* Brown, C. Scott, "The many flavors of Android: A look at the major Android skins," April 2, 2022, available at https://www.androidauthority.com/android-skins-945375/.

[702] *See* Brown, C. Scott, "The many flavors of Android: A look at the major Android skins," April 2, 2022, available at https://www.androidauthority.com/android-skins-945375/.

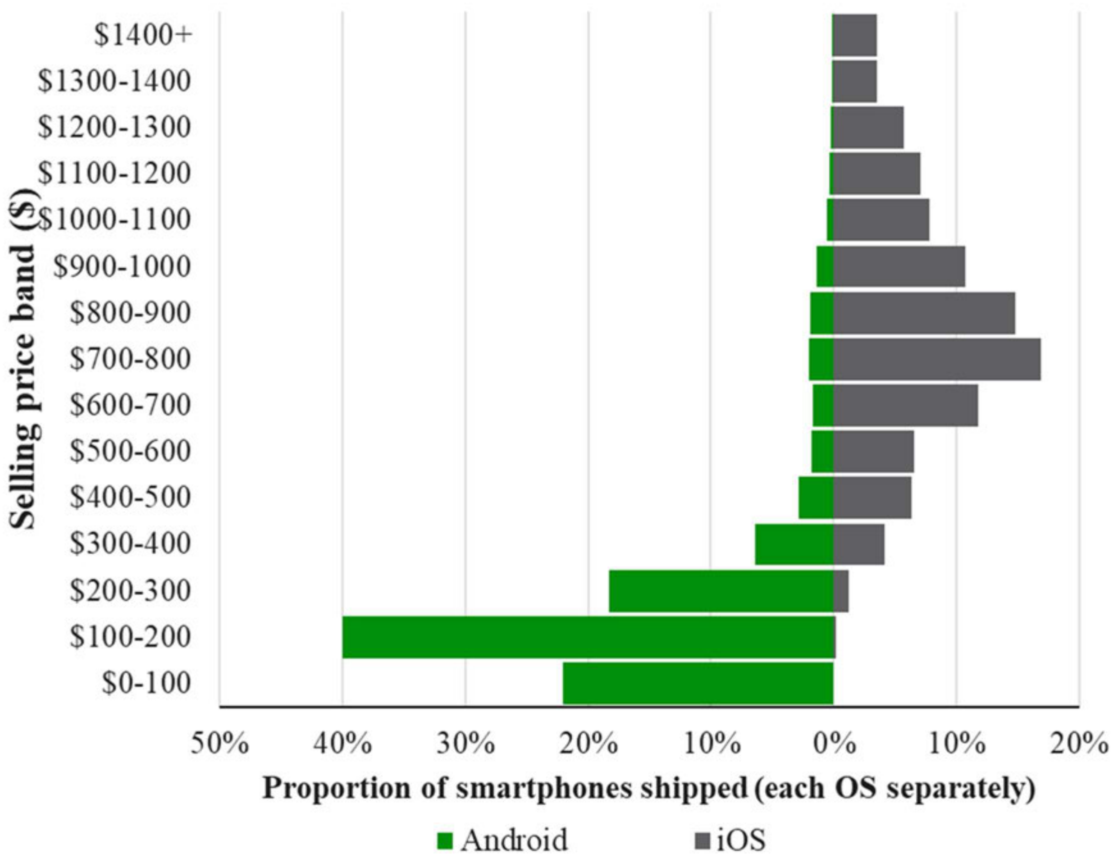
[703] *See,* Nanoreview.Net, "Apple A15 Bionic," available at https://nanoreview net/en/soc/apple-a15-bionic.

[704] *See e.g.*, Peters, Aaron, "How Android Differs Depending on the Hardware Manufacturer," November 9, 2017, available at https://www makeuseof.com/tag/android-differs-hardware-manufacturer/. S*ee also* Nield, David, "4 ways to know if iOS or Android is better for you," March 16, 2022, available at https://www.popsci.com/differences-between-android-and-ios/; *see also* Diffen, "Android vs. iOS," https://www.diffen.com/difference/Android_vs_iOS#Device_Selection.

[705] *See*, Nield, David, "4 ways to know if iOS or Android is better for you," March 16, 2022, available at https://www.popsci.com/differences-between-android-and-ios/.

\$399[706]), iPhone SE (2nd gen) in 2020 (also priced as low as \$399[707]) and a further iteration SE in 2022 (price as low as \$429[708]).

Exhibit 49
Proportion of Smartphones Sold by Price Bracket and OS, Worldwide (excluding China), 2017 – 2021



Note: Data exclude sales of feature phones and tablets.

Source: IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.

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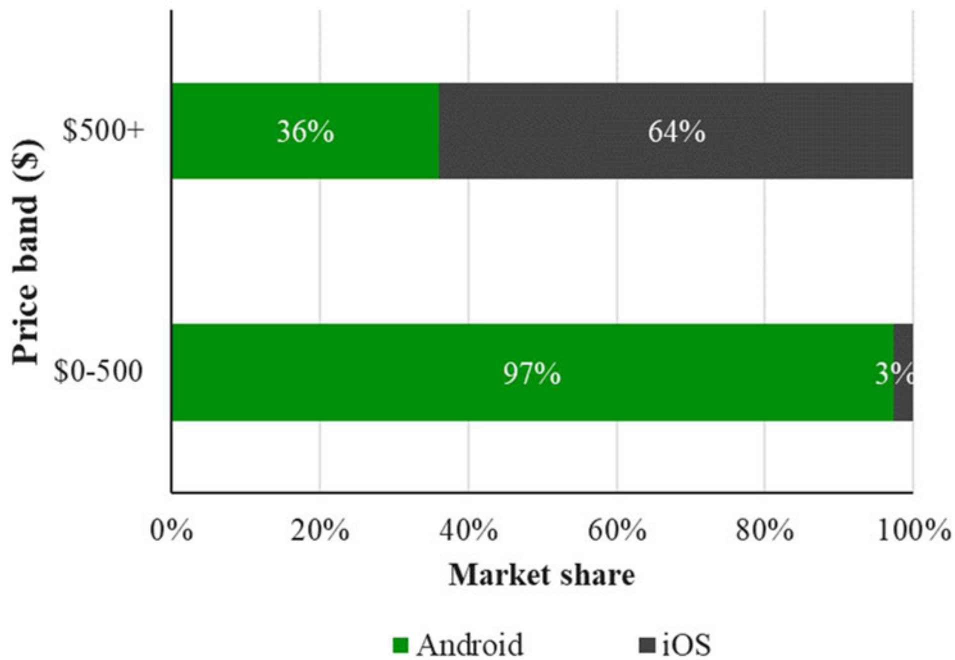
[706] *See* Espósito, Filipe, "Six years later, first-gen iPhone SE runs the latest version of iOS – and it's still good*,"* *available at* https://9to5mac.com/2022/03/22/six-years-later-first-gen-iphone-se-runs-the-latest-version-of-ios-and-its-still-good/.

[707] *See* Bohn, Dieter, "Apple announces the new \$399 iPhone SE for 2020," April 15, 2020, *available at* https://www.theverge.com/2020/4/15/21221918/iphone-se-announcement-apple-price-specs-release-date-features.

[708] *See* MacRumours, "iPhone SE," August 30, 2022, *available at* https://www macrumors.com/roundup/iphone-se/.

333. Unsurprisingly, considering the sale of all smartphones, Android's share of smartphones under $500 between 2017 and 2021 is 97%, with iPhone just 3%. Of smartphones sold over $500, iPhone instead is dominant with a 64% share (compared with Android's 36% share), as depicted in Exhibit 50 below.

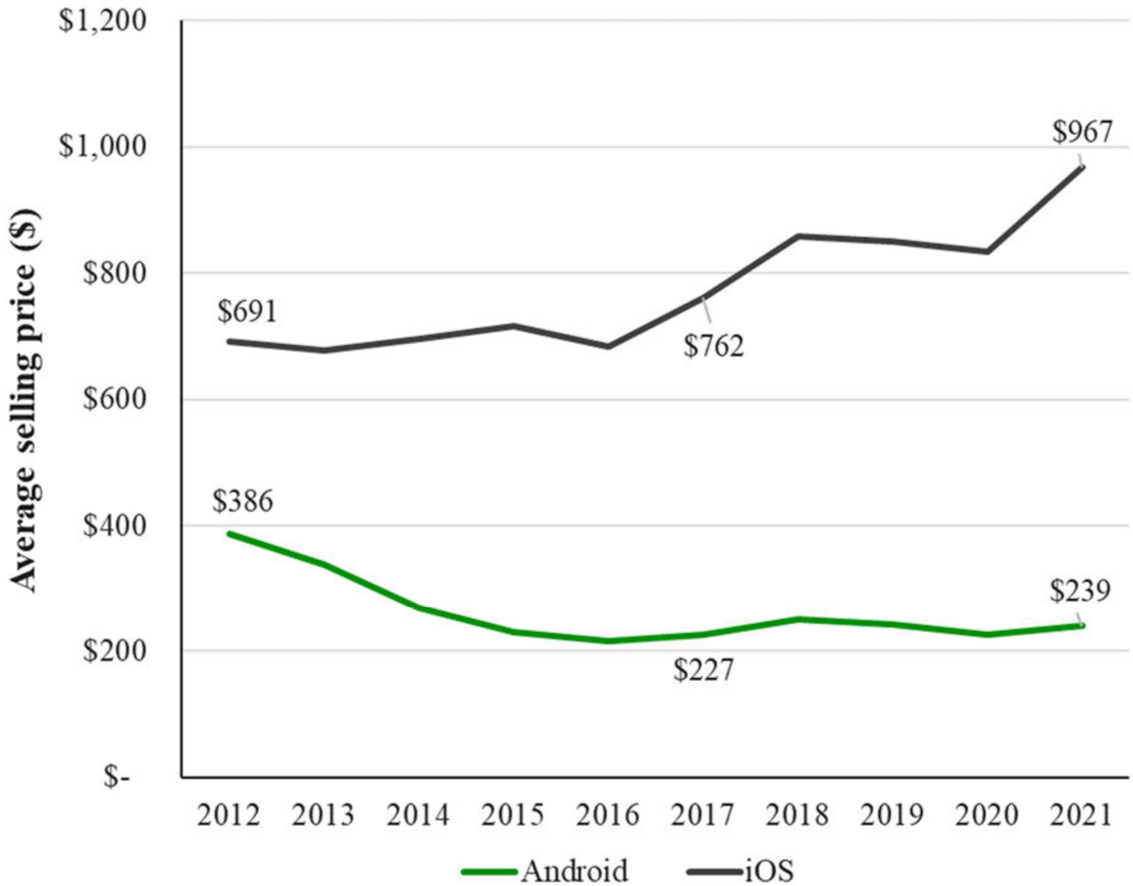
Exhibit 50
Android Dominates Lower Priced Smartphones, 2017 – 2021



Source: IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.

334. Finally, I analyze the average prices of Android and iPhones over the period 2012 to 2021. As depicted in Exhibit 51 below, the average Android smartphone has been consistently under $400, falling from $386 in 2012 to just $227 in 2017 (and has stayed around that level through to 2021). In contrast, the average price of iPhones sold was $691 in 2012 and it has been steadily increasing to $967 in 2021.

Exhibit 51
Average Price of Smartphones Sold by OS, Worldwide (excluding China), 2012 – 2021



Source: IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.

335. Google does not currently charge a license fee for Android and has actively encouraged OEMs to use Android on their smart mobile devices (see Section IV.B), which, Google notes, "has helped increase the number of smartphone owners by enabling [manufacturers] to develop quality smartphones and tablets at low cost."[709] This business model helps explain why most low-priced smart mobile devices are Android devices.

[709] *See,* CMA Final Report on Mobile Ecosystems, ¶3.30.

336. I understand that Google is sometimes concerned about the Apple ecosystem. However, that does not imply that the Apple App Store is in the relevant market or constrains Google's market power. As exemplified by the well-known cellophane fallacy (see Section V.A), even a very strong monopolist may raise price until it faces significant substitution from outside the relevant antitrust market, and, thus, every firm is constrained by some competition no matter its level of monopoly power. Antitrust focuses on raising price above the *competitive price*, not the observed price.

337. Furthermore, antitrust measures of competitive constraints (*e.g.*, in a formal market definition assessment as set out in Section V.A), consider small price increases, typically 5% or 10% (indeed, "small" is the first word in SSNIP). Thus, to represent true competitive concerns, the types of concerns exhibited in Google's documents would need to represent small changes in the way consumers or developers perceive iOS relative to Android that would be equivalent to a price change smaller than a SSNIP. However, if, for example, Google was concerned with large developers (such as Netflix) threatening to produce for iOS and not Android, arguably this would represent much bigger changes to the value of the Android system. Indeed, as described in Section V.C.4, I have earlier documented significant consumer stickiness and switching costs, so an app that can affect OS adoption through its decisions represents what consumers would perceive to be large changes in value.

338. However, even if there was substantial competition between iOS and Android, that would not be sufficient to constrain Google's market power in the Android App Distribution Market. For OS competition to be a constraint on app distribution, it must be that outcomes in the Android App Distribution Market have a significant effect on mobile OS choices. In contrast, to the extent that app distribution is *not* a primary factor that drives mobile OS/device choices, mobile OS competition does *not* constrain the Android App Distribution Market. [redacted] (see Section V.C.4), and, thus, mobile OS competition does not constrain Google's market power in the Android App Distribution Market.

339. App stores on PCs or gaming consoles do not exert competitive pressure on the Android App Distribution Market, due to the different uses of apps on smart mobile devices

compared to apps on PCs or gaming consoles. As discussed in Section V.C.4, apps that are designed with the unique hardware of smart mobile devices in mind often do not function on PCs or gaming consoles, and consumers typically use these devices for different purposes.

5. *Summary on Google's Market Power in the Android App Distribution Market*

340. In summary, I conclude that Google, with the Google Play Store, has monopoly power in the Android App Distribution Market. Google had high and durable worldwide (excluding China) market shares based on several metrics including app store installations, app store pre-installations, app downloads, consumer expenditure on apps, and user engagement (including visits and time spent on app stores). The Android App Distribution Market also exhibits significant indirect network effects and significant costs of starting and expanding a competing app store, which together constitute a substantial barrier to entry and expansion. Google has, as a result of these factors and of its own anti-competitive conduct, sustained supracompetitive commissions in the Google Play Store, resulting in sustained high margins from the Google Play Store, which have not been eroded by competition from alternative Android or non-Android app stores (or sideloading). This evidence is consistent with Google having monopoly power in the Android App Distribution Market.

341. Finally, I note that this conclusion is consistent with the Commission Decision on Google Android, which found that "Google holds a dominant position in the worldwide market (excluding China) for Android app stores since 2011."[710] It is also consistent with the CMA Mobile Ecosystems Final Report, which found that Google has "substantial and entrenched market power in native app distribution, with limited constraints on [the Google Play Store] … On Android, this is driven by a limited constraint from alternative app stores (which have [less than 10]% of native app downloads), limited sideloading and web app usage and very few opportunities for preinstallation."[711]

[710] EC Google Android Decision, ¶ 590.
[711] CMA Final Report on Mobile Ecosystems, ¶ 4.184.

B. Google's Market Share is Consistent with a Very High Degree of Market Power Even if the Relevant Market Includes the Apple App Store

342. Counsel has also asked me to consider, as a hypothetical matter, whether including the Apple App Store in the relevant market leads to market shares that would change my opinion that Google has a very high degree of market power. For the reasons explained in Section VV and Section VI.A.4 above, I conclude that it would not.

343. Worldwide, Android shipped 81.1% of phones in 2014, rising to 86.2% in 2022, while Apple's share diminished from 15.6% to 13.8% during the same period.[712] Together, Google and Apple far surpass the next largest competitor and the hypothetical market that I have been asked to consider could be characterized as a duopoly.

344. Duopolists can wield a very high degree of market power. Thus, I conclude that even if we consider a hypothetical market including iOS, market shares are still consistent with a market in which Google wields a very high degree of market power. Further, Google's power in this hypothetical market would be bolstered by the same factors that led me to conclude that the relevant market should not include iOS in the first place, namely, ecosystem lock-in, low switching, and low user multi-homing, driven by the highly differentiated nature of Android/iOS and different market focus of each. Thus, even if we consider a hypothetical market including iOS, the combination of extreme concentration of the market in two dominant firms, combined with high switching costs are consistent with the Google Play Store possessing a very high degree of market power.

C. Google has Monopoly Power in the Android In-App Billing Services Market

345. [redacted]

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[712] Statista, "Share of global smartphone shipments by operating system from 2014 to 2023," July 27, 2022, available at https://www.statista.com/statistics/272307/market-share-forecast-for-smartphone-operating-systems/.

[redacted][713]

346. In assessing whether Google has monopoly power in the Android In-App Billing Services Market, I consider direct evidence and whether the commission charged by Google is set above the competitive level, structural evidence and barriers to entry / expansion that could limit the ability of potential entrants or existing rivals to constrain Google. Based on my assessment described below, I find Google has monopoly power in the Android In-App Billing Services Market.

347. My conclusion that Google has monopoly power in the In-App Billing Services Market is not relevant to my assessment of whether Google has leveraged its market power in Android App Distribution to require developers to use Google Play Billing.

1. Google Profitably Imposes a Supracompetitive Commission

348. As explained in Section VI.B above, Google charges developers a 30% commission for sales of apps and in-app purchases via Google Play Billing. [redacted][714] [redacted]

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[713] [redacted] *See* Google, [redacted] GOOG-PLAY-000308762.

[714] *See* email from Kevin Du, Google, [redacted] July 17, 2009, GOOG-PLAY-001677481-484 at 483 [redacted] *See also* Google, "Monthly Finance Meeting," August 2020, GOOG-PLAY-000345879.R-898.R, at 886.R.

[redacted][715] [redacted]

[redacted][716]

349. As discussed in Section IV.B.7, Google has recently implemented tiered commissions for certain types of transactions, including 15% for subscription service renewals.[717] [redacted][718] [redacted][720]

[redacted]

350. [redacted][721]

For example:

[715] *See* Google, [redacted] January 26, 2009, GOOG-PLAY-004630018.R-032.R, at 024.R.

[716] Google, "[redacted] June 17, 2020, GOOG-PLAY-001018461.R-468.R at 462.R [redacted]. Google, [redacted] GOOG-PLAY-009245422-443 at 440 [redacted]

[717] *See* Google, "Google Play service fees," Google, available at https://support.google.com/googleplay/android-developer/answer/112622.

[718] *See* Google, [redacted] November 16, 2020, GOOG-PLAY-006990552-571, at 553.

[719] *See* Google, [redacted] January 26, 2009, GOOG-PLAY-004630018.R-032.R, at 024.R; *see also* Google, [redacted] November 16, 2020, GOOG-PLAY-006990552-571, at 555 [redacted]

[720] *See* Google, [redacted] November 16, 2020, GOOG-PLAY-006990552-571, at 555.

[721] [redacted] Google, [redacted]" June 17, 2020, GOOG-PLAY-001018461.R-468.R at 462.R.

- [redacted][722]
- [redacted][724]
- [redacted][725]
- [redacted]

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[722] *See* email from Sameer Samat, Vice President of Product Management at Google, [redacted]" June 8, 2016, GOOG-PLAY-000081809-811, at 811; and Google, [redacted] April 5, 2016, GOOG-PLAY-000578299.R-309.R. at 301.R.-305.R. *See also*, Samat (Google) Deposition, pp. 337-338 ("Q. [redacted] and pp. 345, 469-471, and 483-485.

[723] *See* Google, [redacted] October 30 – November 8, 2017, GOOG-PLAY-000442329-350, at 343 [redacted] *See also* Google, "Monthly Finance Meeting," August 2020, GOOG-PLAY-000345879.R-898.R, at 885.R [redacted]

[724] [redacted] June 10, 2022, GOOG-PLAY-011250116-166, at 120 [redacted]

[725] *See* Google, "Play Policy Feedback," September 28 – October 3, 2017, GOOG-PLAY-000442329-350, at 345-346 [redacted] and Google, "Play Payments Policy," October 31, 2019, GOOG-PLAY-001088669.R-687.R. at 673.R [redacted]. *See also* email from George Audi, Google, [redacted] January 31, 2019, GOOG-PLAY-000259276-279, at 277 [redacted]

[redacted][726] [redacted][727] [redacted][728]

- [redacted][729]

351. [redacted][730] [redacted][731] [redacted][732] [redacted]

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[726] *See* email from Sameer Samat, Vice President of Product Management at Google, [redacted] June 8, 2016, GOOG-PLAY-000081809-811, at 811; and Google, [redacted] July 20, 2020, GOOG-PLAY-003330554-558, at 554-556.

[727] *See* email from Sameer Samat, Vice President of Product Management at Google, [redacted] June 8, 2016, GOOG-PLAY-000081787-789, at 788.

[728] *See* Google's Answers and Objections to Developer Plaintiffs' First Set of Interrogatories, Response to Interrogatory No. 3.

[729] [redacted] *see* Exhibit 67. *See also,* Perez, Sarah, "Google lowers Play Store fees to 15% on subscription apps, as low as 10% for media apps," *Tech Crunch*, October 21, 2021, available at https://techcrunch.com/2021/10/21/google-lowers-play-store-fees-to-15-on-subscriptions-apps-as-low-as-10-for-media-apps.

[730] [redacted] *See,* Google, [redacted] GOOG-PLAY-007329063-073, at 068.

[731] See Exhibit 36.

[732] *See,* Google, "Play Policy Feedback," October 30 – November 8, 2017, GOOG-PLAY-000442329-350, at 329-338. Google, "Play Billing Policy," August, 2019, GOOG-PLAY-003334312-347 at 316. Email from Hiroshi Lockheimer, Senior Vice President of Platforms & Ecosystems at Google, to Sameer Samat, Vice President of Product Management at Google, [redacted] August 1, 2017, GOOG-PLAY-009911010-012 at 011. [redacted] *See also* Google, [redacted] September 2017,

[redacted][733]

352. [redacted][734]

2. Structural Evidence Demonstrates Google's Monopoly Power

a) Google has a very high share of the Android In-App Billing Services Market

353. As discussed above, high market shares can be an indicator of market power. As noted in Section V.D.1, as of 2020, 97% of app developers who sold digital goods via the Google Play Store used Google Play Billing.[735] [redacted][736] Given the Google Play Store's dominance in the Android App Distribution Market and Google Play Billing's very high usage among developers

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GOOG-PLAY-002405918.R-947.R. at 919.R.-921.R. Feng (Google) Deposition, pp. 287-288 [redacted] *See also* email from googleplay-developer-support@google.com to Haseeb Malik, Mobile Publishing Director at Epic, January 9, 2020, EPIC_GOOGLE_01975130-131 at 131 [redacted]

[733] Google, "Billing Policy Compliance," January 2021, GOOG-PLAY-006817773.R-890.R, at 777.R.

[734] Google Transaction Data; *See also* Rysman Workpapers.

[735] *See* Samat, Sameer, "Listening to Developer Feedback to Improve Google Play," *Android Developers Blog*, September 28, 2020, available at https://android-developers.googleblog.com/2020/09/listening-to-developer-feedback-to html.

[736] [redacted] *See* Google, Untitled, July 25, 2019, GOOG-PLAY-007346993-049, at 002.

who distribute apps on the Play Store, Google is likely to have a very high proportion of the total revenues from in-app transactions in the Android In-App Billing Services Market.

354. To estimate Google Play Billing's share of the Android In-App Billing Services Market, I have reviewed Google's financial data on its revenue from Google Play Billing and relevant information from third-party app stores where available.

- [redacted][737]
- As some of that revenue relates to initial app purchases (at the level of app distribution), I deduct an estimate of the proportion of the amount attributed to initial app sales. [redacted][738] Based on that calculation, I find Google's 2019 global revenue from in-app transactions is [redacted]
- I then estimate revenues for in-app purchases through alternative app stores, [redacted][739] Note that the split between initial app purchases and in-app transaction is not available, so I conservatively assume 100% of the revenue relates to in-app transactions.
- [redacted]

[737] *See* Google, "Revenue by app category," GOOG-PLAY-010801685.R. *See also* Rysman Workpapers.

[738] This is calculated is the total revenue from app sales divided by the total revenue from sales of apps and in-app content. [redacted] *See* Rysman Workpapers.

[739] [redacted] *See also* Rysman Workpapers.

[redacted],[740] [redacted]

- I do not have any in-app transaction revenue data on any other Android app stores, including Aptoide, Oppo Apps, Xiaomi Market, Vivo App Store, ONE store, and Yandex. [redacted][741] [redacted][742] [redacted]

- Combining these estimates for the other Android app stores suggests the revenues from in-app transactions on all other Android app stores is [redacted][743]

- Lacking data on other Android app stores for 2017, 2018, 2020 and 2021, I estimate these revenues assuming these app stores have grown at the same rate as the Amazon App Store.

- [redacted][744]

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[740] *See* Google, "[redacted] April 9, 2019, GOOG-PLAY-003332817.R-864.R, at 863.R.

[741] *See* Google, [redacted] October 31, 2019, GOOG-PLAY-002076224.R-238.R at 229.R.

[742] [redacted]. *See* Google, [redacted] GOOG-PLAY-004489655.R-663.R, at 658.R.

[743] *See* Rysman Workpapers.

[744] *See* GOOG-PLAY-010801685. *See also* Rysman Workpapers.

355. Based on this methodology, [redacted].[745] [redacted], as shown in Exhibit 52 below.

Exhibit 52

[redacted]

Sources:

1. GOOG-PLAY-010801685.
2. [redacted]
3. GOOG-PLAY-003332817.R at 863.R.

356. My estimation of Google's share of the Android In-App Billing Services Market described above includes several conservative assumptions, including assuming (i) that all Amazon's revenue is from in-app payments, and (ii) that many of the other Android app stores are a similar size to Samsung (which is highly unlikely given that the Samsung Galaxy Store is pre-installed on every Samsung mobile device. [redacted] However, as noted above, high shares alone are not sufficient to demonstrate monopoly power but must be

[745] *See* Rysman Workpapers. [redacted]

reinforced with high barriers to entry. I next consider whether there are barriers to entry / expansion that limit the ability of potential entrants or existing rivals to constrain Google.

b) Substantial barriers to entry and expansion protect Google's market power

357. Google's contractual agreements with developers, described in Section IV, have limited the extent to which developers can choose their own billing service provider for in-app transactions. As described in Section IV.B.6, Google requires that: (1) apps distributed via Google Play Store ("Play-distributed apps") must use Google Play Billing exclusively for digital in-app transactions; and (2) developers cannot steer consumers to billing service providers other than Google Play Billing for digital in-app purchases.[746] These restrictions have forced developers to either integrate Google Play Billing for digital in-app transactions, or offer a consumption-only app.[747] [redacted][748] [redacted][749]

358. In addition, developers that choose to not comply with Google's restrictions must forego distributing apps through the Google Play Store and, thus, to potentially all Android users.

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[746] *See, e.g.*, §§ 1-4 in "Google Play Payments Policy," Google, November 18, 2021, available at https://support.google.com/googleplay/android-developer/answer/9858738.

[747] *See, e.g.,* Google, "Understanding Google Play's payments policy – Frequently asked questions," available at https://support.google.com/googleplay/android-developer/answer/10281818?hl=en-GB#zippy=%2Ccan-i-offer-a-consumption-only-reader-app-on-google-play. ("Google Play allows any app to be consumption-only, even if it is part of a paid service. For example, a user could log in when the app opens and access content paid for somewhere else.").

[748] *See,* Google, "[redacted]," August 2017, GOOG-PLAY-000262353.R-389.R, at 359.R [redacted]. *See also* Google, [redacted] February 10, 2021, GOOG-PLAY-003890736.R-748.R, at 744.R; and Google, [redacted] August 2019, GOOG-PLAY-007328838-878, at 856; and Google, [redacted] March 9, 2018, GOOG-PLAY-000051671.R-701.R, at 698.R.

[749] Email from Sarah Karam, Google, to [redacted], Google, [redacted] September 4, 2020, GOOG-PLAY-005610941-943 at 943 [redacted]

[redacted][750]

359. These contractual restrictions naturally create a substantial barrier to entry and expansion in the Android In-App Billing Services Market since, without the ability to switch billing service providers, third party providers are unable to challenge Google Play Billing's position in the market. [redacted]

360. As explained in Sections VI.A above, Google has substantial market power in the Android App Distribution Market. The above evidence suggests that, through the contractual restrictions Google has imposed on developers, Google leverages this market power into Android In-App Billing services Market.

3. *Summary on Google's Market Power in the Android In-App Billing Services Market*

361. Based on the evidence and my assessment described above, I find Google has monopoly power in the Android In-App Billing Services Market, [redacted] coupled with substantial barriers to entry, and Google's ability to impose contractual restrictions that require developers to use Google Play Billing for their in-app transactions (which Google can impose due to its market power in the Android App Distribution Market). The result is that Google can charge a supra-competitive commission on in-app transactions [redacted] – see Exhibit 35), with only the very largest developers able to by-pass Google's commission.

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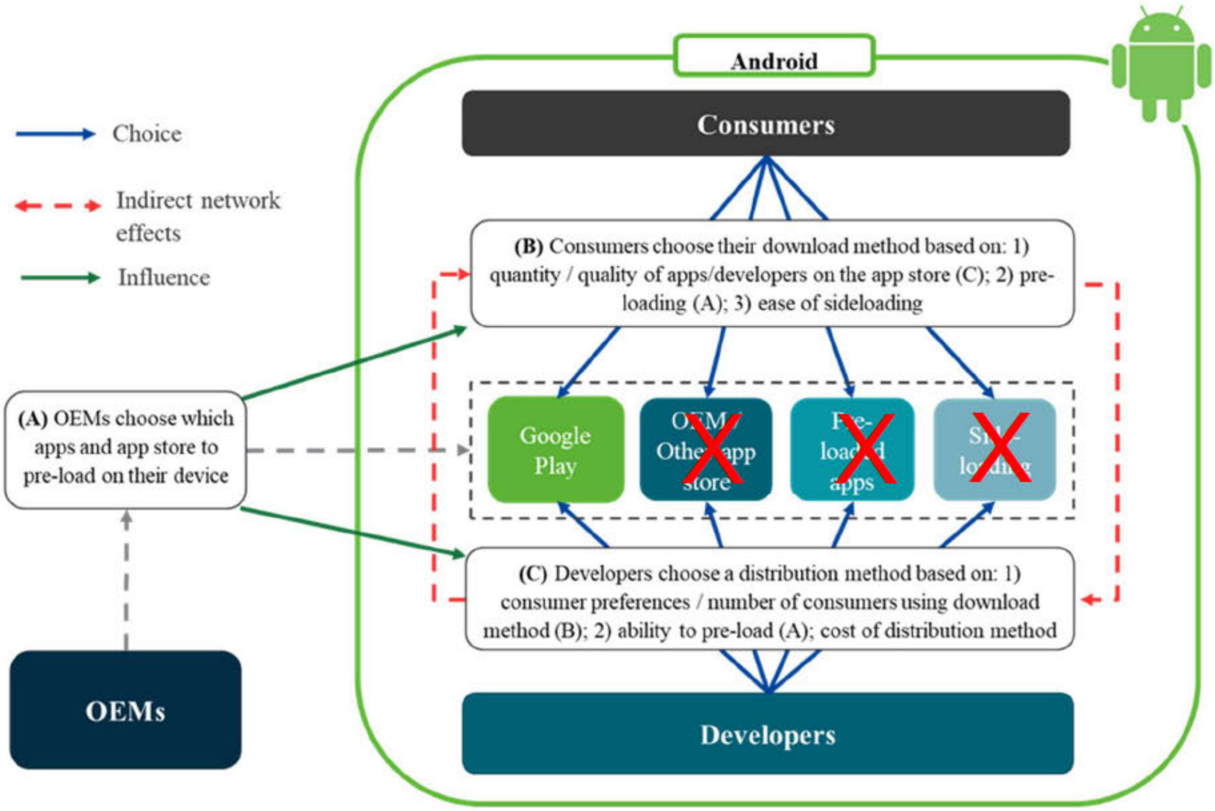
[750] [redacted] *See,* Google, [redacted] April 9, 2019, GOOG-PLAY-003332817.R-864.R, at 824.R and 830.R.

362. Setting aside Google's monopoly power in the Android In-App Billing Services Market, it is my opinion that Google has leveraged its market power in the Android App Distribution Market to require most developers to use Google Play Billing.

VII. Google's Anticompetitive Conduct Harmed Competition in Android App Distribution

363. In this section, I consider whether the conduct described in Section IV made it very difficult for competitors to compete in the Android App Distribution Market described in Sections V.C and VI.A. My conclusion is that it did. I demonstrate that Google's conduct substantially impeded every possible means by which competing Android app stores might reach the necessary scale to be effective competitors: pre-installation on mobile devices and sideloading by consumers. In addition, Google's agreements with certain developers deprived competitor app stores of the ability to launch with exclusive content from those developers. Finally, despite the putatively "open" nature of Android, Google has never permitted other app stores to be downloaded through Android Market or the Play Store. The cumulative effect of the obstacles to competition Google has erected are illustrated in Exhibit 53 below.

Exhibit 53
Google "Closed" Alternative Android App Distribution Channels



364. As explained below; Google did not always pursue the same anticompetitive strategies; it adapted its behavior to block whatever avenue of competition that it faced. As a result, competing app stores exited or chose not to enter the Android App Distribution Market in two key periods: (1) from 2009 to 2014, following the launch of Android Market in 2009, its expansion through 2012, the launch of the Play Store in 2012, and its expansion through 2014; and (2) a second wave beginning in 2019 following Google's entry into RSA 3.0 agreements with exclusivity clauses with OEMs.

365. It is my opinion that Google's anticompetitive conduct reduced competition by rival app stores and had the effect of increasing prices, lowering output, reducing choice, and stifling innovation in the Android App Distribution Market. Moreover, if a rival app store cannot reach a share of consumers, then fewer consumers would attract fewer developers, and then fewer developers would attract fewer consumers, etc. Thus, in a two-sided market, the effect of this reduced competition can be magnified due to indirect network effects.

A. Google's Anticompetitive Conduct Reduced Competition in the Android App Distribution Market

1. Google Has Prevented Competing App Stores from Being Preloaded on Android Smart Mobile Devices

366. Google has enhanced and entrenched its market power in Android App Distribution through various contractual agreements with mobile network operators (a/k/a wireless carriers), OEMs, and app developers, which substantially reduces competition from alternative Android App Distribution methods. I consider two categories of conduct below. First, I consider the effect of Google's contracts related to a contractual agreement not to preload alternative app stores, often in exchange for a revenue share from Google. I calculate the share of Android smart mobile device sales by OEMs which have executed agreements with such provisions, and, coupled with information from Google that the share of devices subject to such an agreement has been increasing and Google's intention to achieve 100% coverage of devices with this restriction, I find that these shares are reflective of Google's market power in Android App Distribution.

367. I also consider the effect of Google's MADAs by calculating the percentage of Android mobile devices that have been governed by a MADA, which mandate preloading the Google Play Store icon in a particular place on the device user interface and requiring OEMs to license the Google Play Store if they want to provide access to marquee Google apps like Gmail, Search, and YouTube. I explain why these requirements that the Google Play Store receive better or equal treatment to any other Android app store on applicable Android smart mobile devices creates barriers to rivals to obtain such placement or discovery from users.

368. As explained in more detail below, I find Google's contractual restrictions and monetary incentives have had the effect of restricting Android App Distribution outside the Google Play Store and, thus, impeding competition by rival Android app stores.

a) Google's Revenue Share Agreements

369. Early on, Google recognized that mobile network operators were key to building its Android ecosystem. Google also recognized that they posed a significant threat to its monopolization of the Android App Distribution Market since they could alter the layout of devices and were best positioned, and even planning, to launch their own rival app stores. For example,

[redacted]"[751] [redacted][752] [redacted]

370. Google communications make the purpose of these agreements clear. [redacted][756]

[751] Google, "Internal Meeting Notes September 15th 2009," September 15, 2009, GOOG-PLAY-001399545-546, at 546.

[752] Jamie Rosenberg, Vice President of strategy for platforms and ecosystems at Google, [redacted] *See* Google, "Deposition of Jamie Rosenberg in the Matter of: In Re – Google Antitrust Litigation," July 14, 2020, GOOG-PLAY-007847148-353, at 273-277.

[753] Email from Tom Moss, Google, to Andy Rubin, Former Google VP and Android Founder, "Subject: Re: Your thoughts on Android Market," February 3, 2009, GOOG-PLAY-001423609-610, at 609.

[754] Email from Tom Moss, Google, to Andy Rubin, Former Google VP and Android Founder, "Subject: Re: Your thoughts on Android Market," February 3, 2009, GOOG-PLAY-001423609-610, at 609.

[755] Google, [redacted]" September 22, 2014, GOOG-PLAY-007264058-069, at 063.

[756] Google, [redacted] October 18, 2014, GOOG-PLAY-000439987.R-017.R, at 012.R.

371. Initially, Google gave to carriers the majority of the 30% commission it imposed on developers.”[757] [redacted][758] [redacted]

Exhibit 54

[redacted]

Source: Google, “OC Quarterly Review — 4Q 2010,” October 12, 2010, GOOG-PLAY-001337211-252, at 226 (emphasis added).

372. [redacted]

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[757] Google’s Android Developers Blog, “Android Market: Now available for users,” October 22, 2008, available at https://android-developers.googleblog.com/2008/10/android-market-now-available-for-users html.

[758] Email from Tom Moss, Google, to Andy Rubin, Former Google VP and Android Founder, “Subject: Re: Your thoughts on Android Market,” February 3, 2009, GOOG-PLAY-001423609-610, at 609.

[redacted][759]

373. [redacted][760] [redacted][761]

374. [redacted]

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[759] Google, [redacted] April 6, 2010, GOOG-PLAY-010165546-552, at 546; Brady (Google) Deposition, pp. 98-99 [redacted]) and p. 107 [redacted]

[760] Email from Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, to John Lagerling, Former Senior Director of Android Global Partnerships at Google, [redacted] March 25, 2011, GOOG-PLAY4-000268331-332, at 331.

[761] Brady (Google) Deposition, p. 119.

[762] [redacted] Feb 1, 2011, GOOG-PLAY-001905152-168, at 158.

[763] [redacted] July 1, 2011, GOOG-PLAY-001834687-707, at 694; *see also* Google, "Business Development Product Deal Executive Summary," June 1, 2011, GOOG-PLAY-009691803-806, at 805.

[764] [redacted] June 1, 2009, GOOG-PLAY-000621177-189, at 186.

[redacted].[770]

375. Consistent with its "change the rules" strategy depicted in Exhibit 54 above, once Google's power over Android App Distribution had been entrenched, it changed the revenue sharing model. [redacted][771]

376. Google's revenue sharing agreements with MNOs and OEMs similarly incentivized these parties to abandon their own app stores and raised the costs for prospective third-party app store developers to compete against Google. I address two examples below.

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[765] [redacted] June 21, 2007, GOOG-PLAY-010203197-227, at 223.

[766] [redacted] "MADA," June 1, 2009, GOOG-PLAY-001745969-981, at 978.

[redacted]" December 1, 2011, GOOG-PLAY-010207461-479, at 468.

[768] [redacted] May 1, 2013, GOOG-PLAY-004330716-749, at 723-724.

[769] [redacted] September 1, 2014, GOOG-PLAY-005706073-086, at 076.

[770] [redacted] August 1, 2012, GOOG-PLAY-001467154-174, 159.

[771] Google, [redacted] May 6, 2015, GOOG-PLAY-001184813-857, at 823 [redacted] See also Google, GOOG-PLAY4-004677224-229, at 22; [redacted] January 1, 2013, ATT-GPLAY-00000692-711, Google and AT&T, [redacted] January 1, 2013, GOOG-PLAY-003604606-625, [redacted] February 1, 2015, GOOG-PLAY-003604601-604; [redacted] August 1, 2013, GP MDL-TMO-0001831-848; [redacted] September 1, 2013, GP MDL-TMO-0002071-098; [redacted] October 26, 2015, GOOG-PLAY-003605103-106; GOOG-PLAY4-002178049; and Email from Matt Schwartz to Jamie Rosenberg, Vice President of Strategy and Operations (Platforms and Ecosystems Division) at Google, Zahavah Levine, Google, TT Ramgopal, Google, Christian Veer, Google, Paul Gennai, Product Management Director at Google, [redacted] GOOG-PLAY-002891881-182.

377. ***T-Mobile***. [redacted][772] [redacted][773]

378. T-Mobile later announced plans to launch an Android app store in the Fall of 2008.[774] T-Mobile's contemplated app store would be available for all Android smart mobile devices, among other platforms.[775] T-Mobile planned to monetize based on bandwidth use.[776] T-Mobile's strategy was to "gut its current, lousy method of distributing mobile apps -- favoring software companies that it has revenue-sharing deals with," like Google, and to instead launch, "[a]n iPhone-like app store that's organized by popularity, not payola."[777]

379. [redacted][778] [redacted]

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[772] Sears (Google) Deposition pp. 34-37.

[773] "[redacted] GOOG-PLAY-001377621-679, at -621, § 1.

[774] *See* Duryee, Tricia, "Updated: T-Mobile USA Will Ditch The Traditional Deck to Mirror Apple's App Store," The Washington Post, August 11, 2008, available at https://www.washingtonpost.com/wp-dyn/content/article/2008/08/08/AR2008080802548 html; Frommer, Dan, "T-Mobile's Big Idea: An iPhone-Like App Store for Every Phone," Business Insider, August 9, 2008, available at https://www.businessinsider.com/2008/8/t-mobile-s-big-idea-an-iphone-like-app-store-for-every-phone; Krzykowski, Matthaus, "Carriers being to believe in data revenue, as Android's puzzle pieces come together," September 10, 2008, available at https://venturebeat.com/2008/09/10/carriers-begin-to-believe-in-data-revenue-as-androids-puzzle-pieces-come-together/; and TechCrunch, "T-Mobile planning an open app store?," August 11, 2008, available at https://techcrunch.com/2008/08/11/t-mobile-planning-an-open-app-store/.

[775] *See* Duryee, Tricia, "Updated: T-Mobile USA Will Ditch The Traditional Deck to Mirror Apple's App Store," The Washington Post, August 11, 2008, available at https://www.washingtonpost.com/wp-dyn/content/article/2008/08/08/AR2008080802548 html.

[776] *See* TechCrunch, "T-Mobile planning an open app store?," August 11, 2008, available at https://techcrunch.com/2008/08/11/t-mobile-planning-an-open-app-store/.

[777] Frommer, Dan, "T-Mobile's Big Idea: An iPhone-Like App Store for Every Phone," Business Insider, August 9, 2008, available at https://www.businessinsider.com/2008/8/t-mobile-s-big-idea-an-iphone-like-app-store-for-every-phone; Krzykowski, Matthaus, "Carriers being to believe in data revenue, as Android's puzzle pieces come together," September 10, 2008, available at https://venturebeat.com/2008/09/10/carriers-begin-to-believe-in-data-revenue-as-androids-puzzle-pieces-come-together/; and TechCrunch, "T-Mobile planning an open app store?," August 11, 2008, available at https://techcrunch.com/2008/08/11/t-mobile-planning-an-open-app-store/.

[778] [redacted] August 10, 2009, GOOG-PLAY-001424478-491, at 479-480.

[redacted].[779] [redacted][780] [redacted][781]

380. [redacted][78[redacted]] [redacted][78[redacted]] [redacted]

[77[redacted]] [redacted] December 1, 2009, GOOG-PLAY-005706961-981, at 962-968.

[780] [redacted]" December 1, 2009, GOOG-PLAY-005706961-981, at 980, at 967-968.

[781] [redacted]" December 1, 2009, GOOG-PLAY-005706961-981, at 980.

[782] [redacted]

[783] Rubin (formerly Google) Deposition, pp. 26 -27 [redacted] Rubin (formerly Google) Deposition, p. 26 [redacted]; GOOG-PLAY-001135055-086, at 057 [redacted] Sears (Google) Deposition, p. 184 [redacted]

[redacted][784]

381. [redacted][785]

382. ***HTC***. As explained above in Section III, HTC was the OEM for the first Android smartphone released on the T-Mobile network in 2008. But Google did not offer GMS apps through the MADA worldwide at that time. [redacted],[787] Malaysia, and Vietnam,[788] HTC phones came preloaded with an alternative app store from SlideME, the SlideME Application Manager[789].

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[784] Email from Nick Sears, Android Co-Founder, to Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, [redacted] October 29, 2009, GOOG-PLAY4-000339905-910, at 907 and Email from Nick Sears, Android Co-Founder, to Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, [redacted]" November 5, 2009, GOOG-PLAY4-000339905-910, at 905.

[785] Email from Cole Brodman, T-Mobile, to Andy Rubin, Former Google VP and Android Founder, [redacted] September 27, 2010, GOOG-PLAY-001055565-567, at 565 [redacted] and Email from Mitch Lustig, T-Mobile, to Jamie Rosenberg, Vice President of Strategy and Operations (Platforms and Ecosystems Division) at Google, [redacted] October 4, 2010, GOOG-PLAY-001143425-427, at 425 [redacted]

[786] Email from Limvirak Chea, Google, to Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, [redacted] November 3, 2009, GOOG-PLAY-010524137-140, at 137 [redacted] and Email from Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, to Limvirak Chea, Google, [redacted]" November 3, 2009, GOOG-PLAY-010524137-140, at 137 [redacted]

[787] Email from Maarten Hooft, Google, to Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, David Conway, Google, [redacted] November 2, 2009, GOOG-PLAY-010470999 [redacted].

[788] SlideME, "SlideME's SAM Marketplace Shows Up on the HTC Hero," September 3, 2009, available at http://slideme.org/blog/htc-hero.

[789] SlideME, "SAM on HTC Mobile Devices," available at http://slideme.org/sam-htc-mobile-devices.

SlideME "found a niche," by loading its app store onto devices in regions where Google could not or would not load Android Market.[790]

383. That changed in February 2011, when HTC and Google executed a worldwide revenue sharing agreement that prohibited HTC from pre-installing third-party app stores like SlideME. The original RSA had a term of 23 months and required that HTC "will not, and will not allow any third party to: implement on a Device any application, product or service which is the same as or substantially similar to Android Market, Google Phone-top Search or the Google Mobile Search Service (or any part thereof)."[791] [redacted][792]

384. [redacted].[793]

385. [redacted][794] [redacted].[795] [redacted].[796]

[790] Email from Dan Morril, Google, to Nikhil Shanbhag, Google, "Subject: Re: alternative Android app distribution sites," December 7, 2009, GOOG-PLAY-007587989.

[791] [redacted]" February 1, 2011, GOOG-PLAY-001905152-168, at 158.

[792] [redacted].

[793] Google, [redacted] GOOG-PLAY-000443763.R-798.R, at 774.R.

[794] Google, [redacted] October 18, 2014, GOOG-PLAY-000439987.R-017.R, at 006.R-007.R.

[795] Google [redacted] May 6, 2015, GOOG-PLAY-001184813-857, at 820-821.

[796] Google, [redacted] May 6, 2019, GOOG-PLAY4-007239946-951, at 946.

386. By sharing its enormous monopoly rents, Google disincentivized OEMs from creating their own app stores or promoting a competing app store. [redacted][797] [redacted][798]

387. [redacted][799] [redacted][800]

388. [redacted][801] [redacted].[802]

389. [redacted][80[redacted]] [redacted]

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[797] Google, [redacted]" GOOG-PLAY-000443763.R-798.R. at 775.R.

[798] Google, [redacted] May 6, 2015, GOOG-PLAY-001184813-857, at 824 and 833.

[799] Google[redacted]" GOOG-PLAY-000443763.R-798.R, at 775.R.

[800] Google, [redacted] May 6, 2015, GOOG-PLAY-001184813-857, at 823.

[801] [redacted]," February 1, 2020, GOOG-PLAY-000416651-697, at 679.

[802] Kolotouros (Google) Deposition, p. 115 [redacted]

[803] Google, [redacted]" July 31, 2020, GOOG-PLAY-007125883-889, at 883.

application preloads … MUST NOT overlap with the following Google preloads in terms of the applications, features, or functionality: Chrome Browser, Contacts, Duo, Gboard, Gmail, Google Assistant, Google Calendar, Google Discover, Google Lens, Google News, Google One, Google Pay, Google Photos, Google Play, Google Podcasts, Google Search app, Messages, and Phone (Dialer)…."[804]

390. [redacted][805] [redacted][806] [redacted][807]

391. [redacted][808] [redacted]

[804] Google, [redacted] July 31, 2020, GOOG-PLAY-007125883-889, at 886.

[805] Google, [redacted]" July 31, 2020, GOOG-PLAY-007125883-889, at 886. [redacted] *See,* e.g., [redacted] April 1, 2020, GOOG-PLAY-005706338-391, at 378.

[806] [redacted]," December 1, 2019, GOOG-PLAY-000620282-321, at 284 [redacted]

[807] [redacted] December 1, 2019, GOOG-PLAY-000620282-321, at 292. *See also* [redacted] February 1, 2020, GOOG-PLAY-000416651-697, at 662; [redacted] March 1, 2020, GOOG-PLAY-001745614-663, at 625-626 [redacted]" March 1, 2020, GOOG-PLAY-000620442-475, at 452; [redacted] April 1, 2020, GOOG-PLAY-000416708-752, at 717; [redacted] April 1, 2020, GOOG-PLAY-000620478-520, at 488; [redacted] March 1, 2020, GOOG-PLAY-000620131-172, at 141; [redacted] March 1, 2020, GOOG-PLAY-000620638-675, at 649; [redacted] April 1, 2020, GOOG-PLAY-005706676-704, at 685; [redacted] April 1, 2020, GOOG-PLAY-005706728-756, at 737; [redacted] April 1, 2020, GOOG-PLAY-005706436-484, at 446; and [redacted] September 1, 2020, GOOG-PLAY-000620770-798, at 778.

[808] Google, [redacted] February, 2020, GOOG-PLAY4-006758735-764, at 738.

[redacted][809]

392. LG and Motorola have exceptions to the Play Store exclusivity provision for their own stores but not for third-party app stores, and, as a result, third-party app stores cannot be pre-installed on LG and Motorola devices. Furthermore, Samsung devices have the Samsung Galaxy Store pre-installed in addition to the Google Play Store, but Samsung does not permit alternative Android app stores to be distributed through the Samsung Galaxy Store.[810] Thus, to be distributed on Samsung smart mobile devices, other alternative Android app stores would need to be sideloaded and, thus, subject to the technological barriers, another means by which Google impedes rival Android app stores, as described in Section VII.A.2 below. Alternatively, while the rival Android app store could negotiate with Samsung to be distributed alongside the Galaxy Store or instead of it, I have found no evidence of Samsung preloading a third-party app store on its smart mobile devices.

393. These exclusivity RSAs with OEMs allow Google to maintain its market power in Android App Distribution and stifle entry/expansion by third-party app stores seeking to be preloaded on mobile devices. These RSAs dampened OEMs' incentives to license from an alternative mobile OS (or develop their own fork of Android, like Amazon).[811] I understand that Google's RSAs with OEMs include Google search as the default search engine,[812] which allows Google to use the revenue it generates from Google Search to fund its agreements with OEMs. I also understand that Google generates less revenue from the MADA license fees than it pays to OEMs under the RSAs – meaning Google effectively pays OEMs to adopt the Android OS.[813] Consequently, for a new entrant to challenge Google's Android OS, they would need to provide

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[809] [redacted] June, 2019, GOOG-PLAY-00457156.R-204.R, at 158.R-159.R.

[810] Samsung Galaxy Store, "App Distribution Guide," available at https://developer.samsung.com/galaxy-store/distribution-guide html ("Apps that offer app download inside the app are not allowed").

[811] Amazon, "Fire OS Overview," available at https://developer.amazon.com/docs/fire-tv/fire-os-overview.html#fire-os-versions.

[812] *See,* CMA Final Report on Mobile Ecosystems, ¶3.153.

[813] *See,* CMA Final Report on Mobile Ecosystems, ¶3.154.

similar incentives to OEMs, essentially monetizing their OS in the same way as Google does with Google Search. However, given Google's strength in the search advertising and search engines market,[814] a new mobile OS entrant would likely be unable to leverage search advertising / search engine revenue to the same extent as Google. [redacted][815] in addition to losing access to the popular GMS suite of apps and APIs. Further, Amazon noted "customers expect a certain 'out of the box' experience with popular and desirable apps pre-installed on their device and that some of the most popular apps are Google apps such as Google Maps and YouTube, which are included in the GMS suite."[816] Thus, Google's exclusivity requirement creates a substantial barrier to entry / expansion for a new mobile OS provider.

394. [redacted].[817] [redacted][818] [redacted]

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[814] Google has more than 90% share in search engines. *See* Statcounter, "Search Engine Market Share Worldwide," available at https://gs.statcounter.com/search-engine-market-share. Additionally, the CMA Market Study into Online Platforms and Digital Advertising found that "Google has significant market power in the general search sector, having had a share of supply of around 90% or higher in the UK for more than a decade. Google's strong position is primarily maintained by three key barriers to entry and expansion: economies of scale in developing a web index; access to click-and-query data at scale; and Google's extensive default positions." *See* CMA, "Online platforms and digital advertising Market Study Final Report," July 1, 2020, available at https://assets.publishing.service.gov.uk/media/5fa557668fa8f5788db46efc/Final_report_Digital_ALT_TEXT.pdf.

[815] [redacted] *See* Google, [redacted] October, 2020, GOOG-PLAY-011057832-886, at 834.

[816] *See,* CMA Final Report on Mobile Ecosystems, ¶3.163.

[817] Google, [redacted] May 6, 2019, GOOG-PLAY4-007239946-951, at 949.

[818] Google, "[redacted] February 24, 2021, GOOG-PLAY-003894142.R-177.R. at 173.R.

[redacted]

Exhibit 55

[redacted]

Source: Google, "Android Commercial Agreements," October 2020, GOOG-PLAY-011057832-886, at 845.

395. Additionally, as depicted in Exhibit 56 below, a September 2020 document states [redacted][820] Additionally, this document

[819] Google, [redacted] February 24, 2021, GOOG-PLAY-003894142.R-177.R, at 176.R [redacted]

[820] [redacted] October 2020, GOOG-PLAY-006861555.R, at 560.R. *See also* GOOG-PLAY-006861555.R, at 560.R, at 568.

[redacted]

Exhibit 56

[redacted]

Source: [redacted] October 2020, GOOG-PLAY-006861555.R, at 560.R.

[redacted]

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821 [redacted] October 2020, GOOG-PLAY-006861555.R, at 561.R.

822 [redacted] October 2020, GOOG-PLAY-006861555.R, at 568.R.

Exhibit 57

[redacted]

Sources: GOOG-PLAY-005706676; GOOG-PLAY-000620282; GOOG-PLAY-001745664; GOOG-PLAY-005706338; [redacted] GOOG-PLAY-005706894; [redacted] GOOG-PLAY-008111867; GOOG-PLAY-000416651; GOOG-PLAY-001745614; GOOG-PLAY-007038477; GOOG-PLAY-000620442; GOOG-PLAY-000416708; GOOG-PLAY-005706436; GOOG-PLAY-000620478; GOOG-PLAY-000620770; GOOG-PLAY-000620814; GOOG-PLAY-005706728; GOOG-PLAY-000620131; GOOG-PLAY-000620210; GOOG-PLAY-007038511; GOOG-PLAY-000620638; GOOG-PLAY-000620837; and GOOG-PLAY-011120406.

397. [redacted]

[redacted]

Exhibit 58

[redacted]

Sources:

1. IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.
2. Exhibit 57.

398. Additionally, I also estimate the share of Android smart device sales in the U.S. for OEMs with RSA 3.0 agreements. As shown in Exhibit 59 below, I estimate that approximately 40.2% to 46.0% of Android smartphone device sales in the U.S. were subject to RSA 3.0 agreements during 2020-2021.

Exhibit 59

[redacted]

Notes:

1. RSA 3.0 OEMs are those for which RSA 3.0 contracts could be identified and confirmed.
2. Excludes Google devices from total Android smartphone sales.
3. Excludes Huawei, an RSA 3.0 OEM for which no Play exclusivity was identified.

Sources:

1. IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.
2. Exhibit 57.

399. Finally, due to the impact of indirect network effects, I find these shares likely do not fully reflect the market dynamics and competitive opportunities available to alternative Android app stores. When an alternative Android app store is unable to reach consumers through OEM pre-installation or distribution through an OEM app store, that alternative app store reaches fewer Android smart device users. Fewer Android smart device customers using that alternative Android app store attracts fewer developers to the store; with fewer developers and the apps they distribute on the store, the few customers are attracted to the store, and so on. Therefore, foreclosure on one side implies a reciprocal foreclosure on the other side, and, thus, the foreclosure is magnified due to

indirect network effects and the virtuous cycle described in Section V.A.2 above becomes a vicious cycle.[823]

b) Google's Offers to Samsung to Neutralize It as a Competitive Threat

400. [redacted][824] Indeed, according to data from IDC, during the period 2012 to 2021, Samsung's share of device sales ranged from 39% to 53% in the U.S. and 32% to 54% worldwide excluding China (see Exhibit 60). The next largest Android OEM during the same period was LG in the U.S., with a peak share of 24% during the same period, and Xiaomi worldwide excluding China with a peak share of 17% in 2021.

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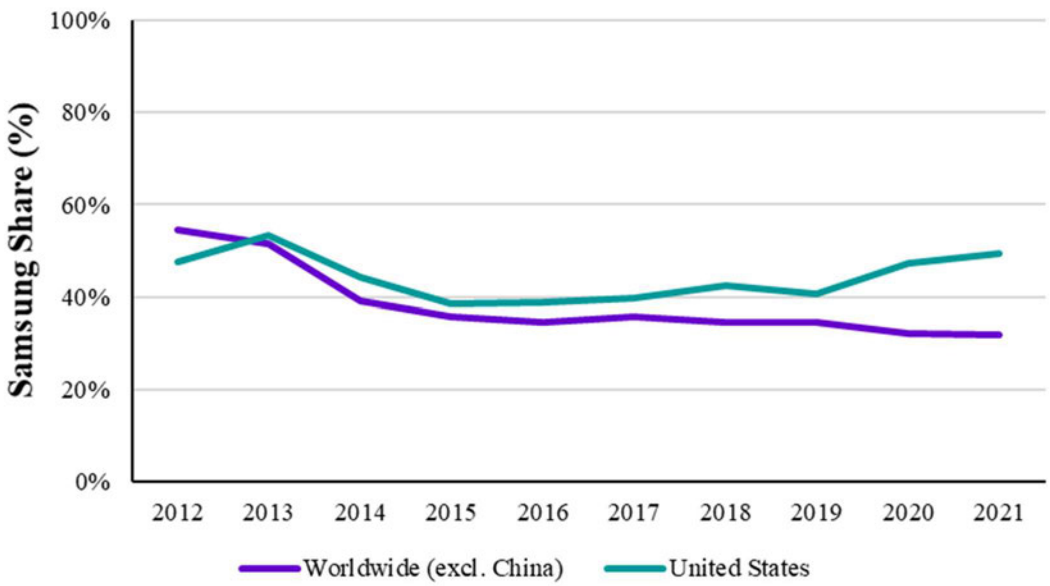
[823] I do not have data or agreements after 2020 that indicate the number of premier tier devices sold worldwide or in the United States. I reserve the right to modify these calculations and present premier tier devices subject to exclusivity clauses as a percentage of worldwide and U.S. Android smart mobile device sales.

[824] Vu, Linda, Brian Brazinski, Josh O'Connor, Shafiq Ahmed, [redacted] Google, February, 2018, GOOG-PLAY-000005203.R-312.R, at 216.R.

Exhibit 60
Samsung's Share of Android Smartphone Devices, 2012 – 2021



Source: IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022.

401. [redacted][825]

402. Google had good reason to view Samsung as a threat to its Android-app-distribution monopoly: In 2018, Samsung allowed Epic Games to launch Fortnite exclusively on the Samsung Galaxy Store.[826] [redacted]

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[825] Google, [redacted] GOOG-PLAY-001267046.

[826] Webster, Andrew and Chris Welch, "Fortnite for Android is launching today exclusively on recent Samsung Galaxy device," August 9, 2018, available at https://www.theverge.com/2018/8/9/17666316/samsung-galaxy-note-9-fortnite-android-release-unpacked-event-2018.

[redacted][827] [redacted][828] [redacted][829]

403. Specifically, [redacted][830]

- [redacted]
  - [redacted]
  - [redacted]
  - [redacted]

404. [redacted]

[827] Email from Hiroshi Lockheimer, Senior Vice President of Platforms & Ecosystems at Google, to Erin Crosby, Google, Sameer Samat, VP of Product Management at Google, [redacted] June 12, 2019, GOOG-PLAY-001877016.C-022C, at 018.C and Email from Jamie Rosenberg, Vice President of Strategy and Operations (Platforms and Ecosystems Division) at Google, to Erin Crosby, Google, Sameer Samat, VP of Product Management at Google [redacted] June 11, 2019, GOOG-PLAY-001877016.C-022.C, at 020.C

[828] Google, "Play Monthly," March 2019, GOOG-PLAY-004508753.R-851.R, at 765.R.

[829] Rosenberg (Google) Deposition, pp. 99-100.

[830] Google, [redacted] April 26, 2019, GOOG-PLAY-007246367-395, at 395.

[redacted][832]

405. [redacted][837]

[831] Google [redacted] April 26, 2019, GOOG-PLAY-007246367-395, at 392.

[832] Email from Jay Kim, Samsung, to Jim Kolotouros, Vice President, Android Platform Partnerships at Google, Christopher Li, Director and Head of Product Growth at Google, Seung Song, Samsung, [redacted] June 20, 2019, GOOG-PLAY4-004259429 [redacted]

[833] Email from Jay Kim, Samsung, to Jim Kolotouros, Vice President, Android Platform Partnerships at Google, Christopher Li, Director and Head of Product Growth at Google, Seung Song, Samsung, [redacted] June 20, 2019, GOOG-PLAY4-004259429 and Google, [redacted] June 20, 2019, GOOG-PLAY4-004259430(attachment).

[834] Google, [redacted] June 20, 2019, GOOG-PLAY4-004259430; Kolotouros (Google) Deposition, p. 470 [redacted]; and Rosenberg (Google) Deposition, p. 118 [redacted]

[835] Google, "[redacted]" June 20, 2019, GOOG-PLAY4-004259430, at 430.

[836] Google, "[redacted]," June 20, 2019, GOOG-PLAY4-004259430, at 431.

[837] Google, "[redacted]" June 20, 2019, GOOG-PLAY4-004259430, at 432.

406. [redacted][839]

407. [redacted].[842]

c) Google Restricted Competition from Third-Party App Stores Through Mobile App Distribution Agreements with OEMs

408. [redacted]

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[838] Kolotouros (Google) Deposition, p. 383.

[839] Email from Jamie Rosenberg, Vice President of Strategy and Operations (Platforms and Ecosystems Division) at Google, to Google Personnel, [redacted]" July 11, 2019, GOOG-PLAY-003720093 and *see* GOOG-PLAY-001059135 ([redacted]; and Google, "Samsung Update," July, 2019, GOOG-PLAY-001183163.R-188.R, at 166.R [redacted]

[840] Rosenberg (Google) Deposition, p. 125.

[841] Google and Samsung, [redacted] July 1, 2020, GOOG-PLAY-003604372-410, at 372.

[842] Porat (Google) Deposition, p. 169 [redacted]

[redacted]

(1) [redacted]

Exhibit 61

[redacted]

Sources:

1. [redacted] November 1, 2009, GOOG-PLAY-001477713-726, at 717; [redacted] October 1, 2009, GOOG-PLAY-000621075-084, at 078. [redacted]. See, e.g., [redacted] June 1, 2009, GOOG-PLAY-001745969-981, at 978.
2. [redacted]" January 1, 2012, GOOG-PLAY-000617360-371, at 363 and 361; [redacted] January 1, 2011, GOOG-PLAY-000857382-393, at 385-386 and 383[redacted] January 1, 2011, GOOG-PLAY-000621085-096, at 086 and 088; and [redacted] December 1, 2011, GOOG-PLAY-000416789-800, at 790 and 792. [redacted] "MADA (Android)," July 1, 2012, GOOG-PLAY-001089608-619, at 611 and 609.
3. [redacted] "MADA," March 1, 2014, GOOG-PLAY-000617555-576, at 557-558 and 561-562; [redacted] "MADA," March 1, 2014, GOOG-PLAY-000617577-592, at 578-579 and 582; [redacted] "MADA," May 1, 2016, GOOG-PLAY-007981395-410, at 396-397 and 400; [redacted] "MADA," July 1, 2013, GOOG-PLAY-000617505-521, at 506-507 and 510; [redacted] November 1, 2014, GOOG-PLAY-000617749-766, at 750-751 and 755 [redacted] April 1, 2014, GOOG-PLAY-000416327-341, at 328-329 and 331-332; [redacted] April 1, 2015, GOOG-PLAY-000416373-392, at 374-375 and 380; and [redacted] February 1, 2015, GOOG-PLAY-000617778-797, at 780-781 and 785-786.
4. [redacted] October 1, 2017, GOOG-PLAY-000618885-910, at 887 and 893-894; [redacted] August 1, 2017, GOOG-PLAY-000618863-884, at 865 and 871; [redacted] November 1, 2017, GOOG-PLAY-009640439-467, at 442 and 450; [redacted] July 1, 2017, GOOG-PLAY-000618559-581, at 561-562 and 567-568; [redacted] July 1, 2017, GOOG-PLAY-000618749-771, at 752 and 758; [redacted] July 1, 2017, GOOG-PLAY-000618341-363, at 344 and 350; [redacted] August 1, 2017, GOOG-PLAY-000416477-497, at 479 and 485; [redacted] September 1, 2017, GOOG-PLAY-000416454-476, at 456-457 and 462-463. [redacted] October 1, 2017, GOOG-PLAY2-000456929-966, at 933 and 942.

410. [redacted]

[redacted]

[redacted]

Exhibit 62

[redacted]

Source: Google, [redacted] March 2015, GOOG-PLAY4-002369232-252, at 247.

[redacted]

[843] Email from Garry McCollum, Google, to Marcos Steverlynck, Google, "[redacted] July 12, 2010, GOOG-PLAY-010939023-025, at 023, and attachment, Marcos Steverlynck, "GOOG-PLAY-010939026_CONFIDENTIAL.xls," July 12, 2010, GOOG-PLAY-010939026.

[844] Google, [redacted]" March, 2015, GOOG-PLAY4-002369232-252, at 247 and Gold (Google) Deposition, pp. 153-154 [redacted]

[845] Email from Tamara Hrivnak, Google, to Natascha Bock, Google, "[redacted] April 24, 2015, GOOG-PLAY-000832471-473, at 471. *See also* Google, [redacted]" September 22, 2014, GOOG-PLAY-007264058-068, at 060.

[redacted][847]

413. Google admitted in its submission to the European Commission in connection with its investigation of Android that "[p]re-loading these apps and placing Search on the home screen is unquestionably valuable to Google."[848] [redacted][850]

414. [redacted][851]

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[846] Email from Ben Serridge, Director of Product Management at Google, to Jonathan Zepp, Google, [redacted] June 06, 2019, GOOG-PLAY-006355073-074, at 073.

[847] Email from Vitor Baccetti, Google, to Andy Abramson, Google, [redacted] October 20, 2016, GOOG-PLAY-007932523-525, at 523.

[848] EC Decision ¶ 780(1) and ¶ 789(1) (admission by Nokia that "being prominently visible on a smartphone's home screen or near to the home screen inevitably increases the likelihood of consumers trying out the app."); and ¶ 789(5) (data from Yandex, a competitor to Google Search and member of the "One Platform Foundation" of third-party app stores showing that its market share jumped when its search icon was placed on the home screen with default permissions as compared to placement on a screen one swipe away).

[849] Google, [redacted] March 17, 2016, GOOG-PLAY-004494298.R-325.R, at 307.R.

[850] [redacted]

[851] [redacted] October 1, 2017, GOOG-PLAY-000618885-910, at 895; [redacted] August 1, 2017, GOOG-PLAY-000618863-884, at 873; and [redacted] November 1, 2017, GOOG-PLAY-009640439-467, at 452.

(2) Google's bundling of GMS apps with the Google Play Store

415. [redacted][852] [redacted].[853] [redacted]

[852] Brady (Google) Deposition, pp. 201-202 [redacted]; Li (Google) Deposition, p. 194 [redacted] Email from Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, to Doug Yeum, Google, [redacted] April 27, 2010, GOOG-PLAY4-000341393-394, at 393 [redacted] and Email from Doug Yeum, Google, to Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, [redacted]" April 26, 2010, GOOG-PLAY4-000341393-394, at 393.

[853] Google, "GOOG-PLAY-006334343-GOOG-PLAY-006334343-GOOG-PLAY-006334343_HIGHLY CONFIDENTIAL - ATTORNEYS' EYES ONLY.xlsx," GOOG-PLAY-006334343, Sheet = [redacted]

Exhibit 63

[redacted]

Notes:

1. [redacted]
2. [redacted]

Sources:

1. [redacted] November 1, 2009, GOOG-PLAY-001477713-726, § 1.10; [redacted] June 1, 2009, GOOG-PLAY-001745969-981, Exhibit A; and [redacted] October 1, 2009, GOOG-PLAY-000621075-084, § 1.10.
2. [redacted] March 1, 2014, GOOG-PLAY-000617555-576, § 1.1(m); [redacted] March 1, 2014, GOOG-PLAY-000617577-592, § 1.1(m); [redacted] May 1, 2014, GOOG-PLAY-007981395-410, § 1.1(m); [redacted] March 1, 2014, GOOG-PLAY-000617505-521, § 1.1(m); [redacted] November 1, 2014, GOOG-PLAY-000617749-766, § 1.1(m); Google and

[redacted] April 1, 2014, GOOG-PLAY-000416327-341, § 1.1(m); [redacted] April 1, 2015, GOOG-PLAY-000416373-392, § 1.1(m); and [redacted] February 1, 2015, GOOG-PLAY-000617778-797, § 1.1(m).

3. [redacted] December 7, 2020, GOOG-PLAY-006334343, [redacted] see also [redacted]

416. [redacted][854] [redacted][855]

417. [redacted]

418. OEMs also need to pre-load GMS in order ensure that many third-party apps will work. For example, the Google Play Services API Fused Location Provider allows developers to choose the level of precision desired to determine device location: "For example, you can request the most accurate data available, or the best accuracy possible with no additional power consumption."[856] Google states that the work to determine location with a given level of precision

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[854] Brady (Google) Deposition, p. 45 [redacted]

[855] Email from Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, to Wireless Biz, [redacted] October 13, 2008, GOOG-PLAY-008471716, at 717.

[856] Google, "Simple, battery-efficient location API for Android," available at https://developers.google.com/location-context/fused-location-provider.

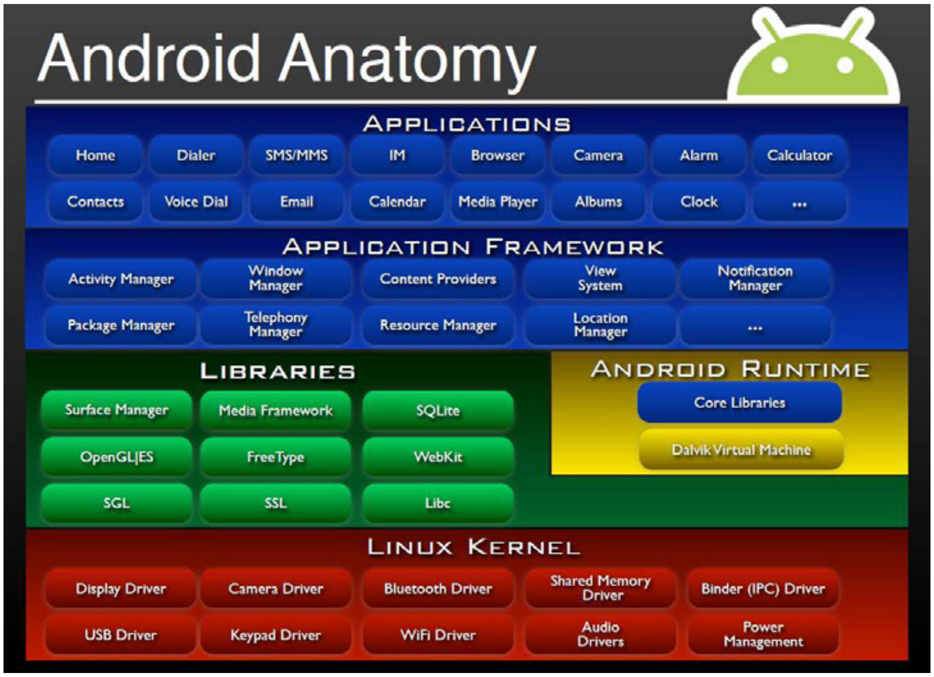
is "challenging" without Fused Location Provider, as this API "removes the guesswork by automatically changing the appropriate system settings." [857] [redacted] [858]

419. Google engineered OEMs' reliance on GMS. Before the original open-source Android was released, Google marketed it as including a host of open-source apps, including text and instant messaging, a browser, and an email app, as depicted in Exhibit 64 below.

[857] Google, "Simple, battery-efficient location API for Android," available at https://developers.google.com/location-context/fused-location-provider.

[858] PX647 [redacted] May 2019, GOOG-PLAY-000128863.R-908.R, at 876.R [redacted] and Kolotouros Deposition, p. 448 [redacted]

Exhibit 64
Google Marketing of Android Apps as Open Source[859]



Source: Brady, Patrick, "Android Anatomy and Physiology," Google, available at https://sites.google.com/site/io/anatomy--physiology-of-an-android.

420. Over time, however, Google stopped updating or removed functionality from open-source Android apps. [redacted][861]

[859] Brady, Patrick, "Android Anatomy and Physiology," Google, available at https://sites.google.com/site/io/anatomy--physiology-of-an-android and Brady (Google) Deposition, p. 321 [redacted]

[860] Email from Dave Burke, Google, to Hiroshi Lockheimer, Senior Vice President of Platforms & Ecosystems at Google, [redacted] October 19, 2011, GOOG-PLAY4-000821936-940, at 938.

[861] Email from Dan Morrill, Google, to Hiroshi Lockheimer, Senior Vice President of Platforms & Ecosystems at Google, [redacted] October 19, 2011, GOOG-PLAY4-000821936-940, at 937-38.

421. Google released the Chrome browser for Android in February 2012.[862] [redacted][864]

422. [redacted]

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[862] Swift, Mike, "Google launches Chrome browser for Android smartphones," *Phys.Org*, February 9, 2012, available at https://phys.org/news/2012-02-google-chrome-browser-android-smartphones html.

[863] Email from Andy Rubin, Former Google VP and Android Founder, to Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, [redacted] April 18, 2012, GOOG-PLAY-001449657 and Brady (Google) Deposition, pp. 322-326.

[864] Brady (Google) Deposition, pp. 327-328 [redacted] and Email from Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, to Srikanth Rajagopalan, Google, [redacted] June 18, 2012, GOOG-PLAY-001460686-692, at 686 [redacted]

[865] Email from Jon Larimer, Google, to Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, Selim Gurun, Google, [redacted]," January 23, 2014, GOOG-PLAY4-001703880-885, at 884 [redacted]nd Brady (Google) Deposition, p. 330 [redacted]

[866] Email from Hiroshi Lockheimer, Senior Vice President of Platforms & Ecosystems at Google, to Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, Selim Gurun, Google, [redacted] January 23, 2014, GOOG-PLAY4-001703880-885, at 881.

[867] Brady (Google) Deposition, p. 346 [redacted]

[redacted]

Exhibit 65

[redacted]

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[868] Email from Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, to Liza Ma, Google, [redacted] September 24, 2013, GOOG-PLAY-001346566-568 [redacted]

[869] PEmail from Bart Sears, Google, to Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, Selim Gurun, Google, [redacted] January 23, 2014, GOOG-PLAY4-001703880-885, at 883 [redacted] and Brady (Google) Deposition, p. 337 [redacted] *See* Smith, Chris, "Android 4.4 KitKat official – here's what you need to know," *Android Authority*, October 31, 2013, available at https://www.androidauthority.com/android-4-4-kitkat-official-what-you-need-to-know-313100/.

Source: Patel, Rakesh, [redacted] Google, February 25, 2015, GOOG-PLAY-002546242-279, at 247.

[redacted].[870]

423. [redacted]

424. [redacted][872] Thus, using data from IDC, I calculate that, for 2020-2021, 96.15% of Android

[870] Email from Junichi Monma, Google, to Madan Ankapura, Google, Jon Gold, Finance Manager for Android at Google, Sagar Kamdar, Google, [redacted] January 24, 2017, GOOG-PLAY-008727310 [redacted]

[871] *See, e.g.*, Google, "Android 101," May 2019, GOOG-PLAY-000128863.R-908.R, at 876.R [redacted] *See also* Kolotouros Deposition, p. 448 [redacted]

[872] Kolotouros (Google) Deposition, p. 93 [redacted]

smartphone devices worldwide (excluding China) and 99.97% in the United States are sold by OEMs with a MADA.[873] Therefore, it is my opinion that the MADAs created barriers to entry for third-party app stores and enhanced and entrenched Google's market power in Android App Distribution.

2. *Google Restricted Competition from Third-Party App Stores Through Technological Barriers Aimed at Deterring Sideloading*

425. The final means by which a competing app store might reach users is direct downloading from the web, *i.e.*, sideloading, explained in Section III.C.2 above. [redacted][874] These restrictions increase the friction users experience in trying to install a new app store, which in turn causes users to abandon the attempt. These warnings are effective: Google data shows that sideloading accounts for only 4% of Android app installations (see Section III.C.2).

426. [redacted][875] [redacted]

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[873] *See* Rysman Workpapers.

[874] [redacted] September 3, 2019, GOOG-PLAY-001181435-503, at 453 [redacted] As Dr. Mickens explains in his report, the practical consequence of locking OEMS into a particular, Google-proprietary version of AOSP (open-source) middleware is that neither the moments at which installation friction is generated nor the prompts shown during those moments can be changed from their AOSP defaults. *See* Mickens Report at ¶ 166 & Figures 22 to 24.

[875] Google, [redacted] July 19, 2018, GOOG-PLAY-007278690-740, at 694.

[redacted][876]

427. [redacted][877]

[redacted]

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[876] *See, e.g.*, Cunningham, Edward, [redacted] Google, February 1, 2021, GOOG-PLAY-004903945-947 [redacted] (*see* Cunningham (Google) Deposition, pp. 164-166), [redacted] *See* note 134 *supra*.

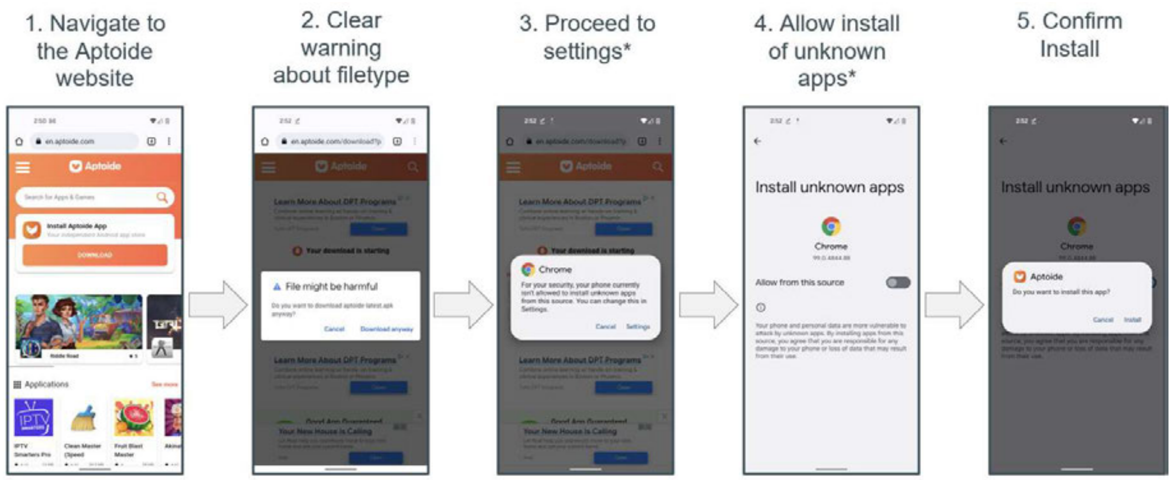
[877] Rolefson, Dave, Ben Byon, Adrienne McCallister, and David Noam, [redacted] Google, March 17, 2016, GOOG-PLAY-04494298.R-325.R, at 318.R-320.R.

[redacted]

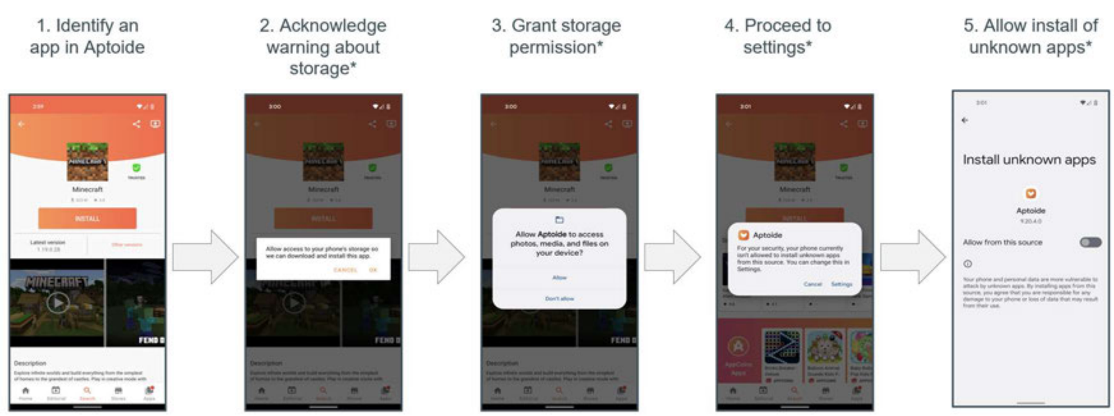
[redacted]

428. I understand that James W. Mickens, the Gordon McKay Professor of Computer Science at Harvard University, a co-director of Harvard's Berkman-Klein Center for Internet and Society and a co-director of Harvard's Institute for Rebooting Social Media, who has been retained as an expert by Epic Games, the Plaintiff States, and the Match Group Plaintiffs ran tests as part of his engagement in this matter to identify the steps Android must currently follow to download a

third-party *app store*. In Figure 23 of his report, as depicted below, he sets forth those steps using an attempt to download competing app store Aptoide as an example:[878]



429. In Figure 22 of his report, as depicted below, Dr. Mickens sets out the steps Android users must currently follow to download an *app* from a competing app store (after the user has installed the app store on their device):[879]



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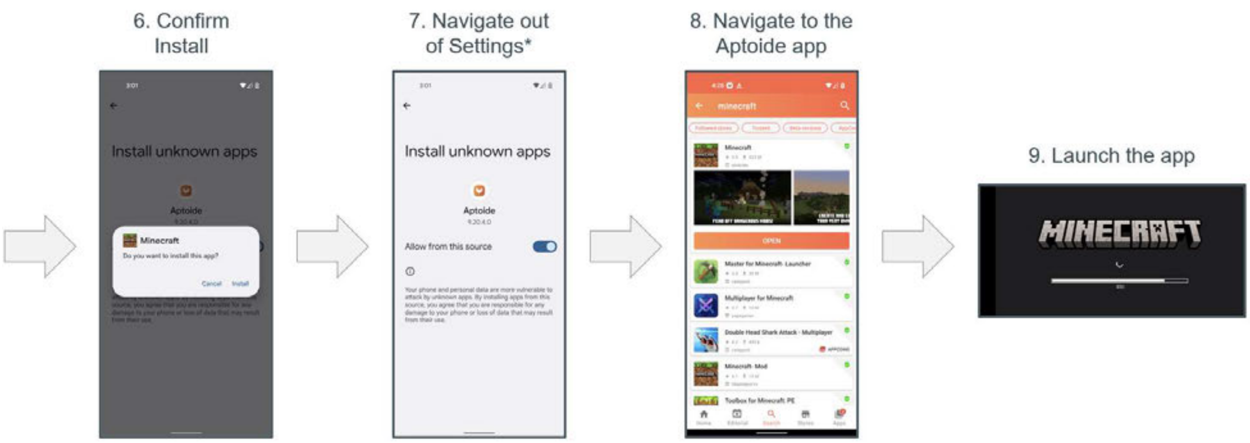
[878] Mickens Report, p. 66 (describing Figure 23 as an "[e]xample of directly installing the Aptoide app store on a Pixel 4a phone running Android 12"). He notes that "[t]he same prompts and warnings were seen on the rest of the Android phones that we tested."

[879] Mickens Report, pp. 65 (describing Figure 22 as an "[e]xample of installing an app via the Aptoide third-party app store" using "a Google Pixel 4a phone running Android 12").



430. Dr. Mickens describes the steps as follows:[880]

In the leftmost screen, the user has located the app to install via the Aptoide app. In this particular example, the user wants to install the Minecraft app. When the user confirms the desire to install the app by clicking on the "Install" button, Android asks the user whether she wants to allow the app store to download the app's APK file. Android then asks the user whether she allows the app store to access her phone's "photos, media, and files." Next, Android informs the user that "For your security, your phone is not allowed to install unknown apps from this source. You can change this in Settings." If the user clicks on the "Settings" button in that dialog box, the user then has the option to enable app installation via the Aptoide store. If the user selects that option, Android shows another prompt which asks the user whether she wants to install the application. If the user clicks "Install," Android returns the user to the "Settings" screen. The user must then manually navigate away from this screen and back to the Aptoide app screen. At this point, the user can finally launch the installed app. [If a user installs additional apps via Aptoide, the friction screens denoted by "*" will no longer be shown during subsequent installs.].

431. [redacted][881] [redacted][882] [redacted]

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[880] Mickens Report, p. 65 (alteration in original).

[881] Lim (Google) Deposition, p. 255. *See also* Mickens Report, ¶ 99.

[882] Google, "AP-PS: Unknown Sources," September, 2018, GOOG-PLAY-000219435.R-475.R, at 457.R [redacted]

[redacted]

432. Google's security warnings and technological hurdles have made it more difficult to obtain even popular apps from well-known developers. [redacted][888] Similarly, in summer 2018, after Google began flagging competing app store Aptoide as "a harmful app, hiding it in users' Android devices and requesting them to uninstall it,"[889] Android users that attempted to download Aptoide received a warning message from Google that the download was "unsafe" and "can

[883] Google, [redacted] March 24, 2020, GOOG-PLAY-004904016.R-118.R, at 038.R [redacted] GOOG-PLAY-000415076-078, at 076 [redacted]

[884] Lim (Google) Deposition, p. 255.

[885] Lim (Google) Deposition, p. 258-59.

[886] Kolotouros (Google) Deposition, p. 99 [redacted].

[887] GOOG-PLAY-000219435.R, at 438.R.

[888] Rolefson, Dave, Ben Byon, Adrienne McCallister, and David Noam, [redacted] Google, March 17, 2016, GOOG-PLAY-04494298.R-325.R, at 317.R.

[889] Lomas, Natasha, "Aptoide, a Play Store rival, cries antitrust foul over Google hiding its app," *Techcrunch*, June 4, 2019, available at https://techcrunch.com/2019/06/04/aptoide-a-play-store-rival-cries-antitrust-foul-over-google-hiding-its-app/.

download potentially harmful apps."[890] Aptoide estimates it lost 15-20% of its user base in the year following Google's action.[891] [redacted][893]

433. A survey conducted by Dr. Stanley Presser in this matter confirms my conclusion that Google's security warnings have foreclosed competition from sideloading by making it less likely that users will sideload apps or app stores. I understand that, at the request of counsel for the Plaintiff States and the Consumer Class, Dr. Presser designed a survey that was designed in part to estimate "the reaction of U.S. Android phone users to a warning message that may be displayed when the user attempts a download from a website or an app store that is not preloaded on the user's phone."[894] The relevant part of Dr. Presser's questionnaire told respondents, "Here is a message that might appear on the phone you now use if you try to download an app from somewhere other than the Play Store," and this warning message was displayed:

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[890] Lomas, Natasha, "Aptoide, a Play Store rival, cries antitrust foul over Google hiding its app," Techcrunch, June 4, 2019, available at https://techcrunch.com/2019/06/04/aptoide-a-play-store-rival-cries-antitrust-foul-over-google-hiding-its-app/.

[891] Lomas, Natasha, "Aptoide, a Play Store rival, cries antitrust foul over Google hiding its app," Techcrunch, June 4, 2019, available at https://techcrunch.com/2019/06/04/aptoide-a-play-store-rival-cries-antitrust-foul-over-google-hiding-its-app/.

[892] [redacted]

[893] D[redacted]

[894] Presser Report, p. 2.

> Allow from this source
>
> Your phone and personal data are more vulnerable to attack by unknown apps. By installing apps from this source you agree that you are responsible for any damage to your phone or loss of data that may result from their use.

Half of the respondents, randomly selected, were then asked, "If you saw this message on your phone, would you feel it was … safe to download the app or it was not safe to download the app?" while the other half were asked "If you saw this message on your phone, would you feel it was … not safe to download the app or it was safe to download the app?" Respondents were also asked, "Would this message make you less likely to download the app?" According to Dr. Presser's report, "[m]ost respondents said that they would feel the app was not safe to download [82% (+/- 6%) and 86% (+/- 5%) in the two different orderings of the response options]. Likewise, most said they would be less likely to download it [84% (+/- 4%)]."[895]

434. Economic literature on user friction also confirms that Google's efforts would decrease the number of users who sideload apps. Consumers are unlikely to have perfect information about whether sideloading is dangerous or not and are likely to take messages (security warnings) from Google seriously. The economics literature supports that consumers are responsive to information provided by sellers and that consumers would consume more of a good (or demand

[895] Presser Report, p. 9.

would increase) if they believe the good is of high quality (and consume less if they believe the good is of low quality).[896]

435. [redacted][897] enabled. [redacted][898]

436. [redacted]

[896] Saeedi, Maryam, "Reputation and adverse selection: theory and evidence from eBay," *RAND Journal of Economics*, Vol. 50, No. 4, 2019, pp. 822-853, at 838; Kamenica, Emir and Matthew Gentzkow, "Bayesian Persuasion," *American Economic Review*, Vol. 101, No. 6, 2011, pp. 2590-2615, at 2606-2608. Further, evidence from the computer science literature based on experimental and field data suggest that mobile users experiencing security warnings "led to significantly higher perceived threat to personal information, more negative attitudes toward the mobile service and a lower tendency for future use." *See* Zhang, Bo, et al., "Effects of Security Warnings and Instant Gratification Cues on Attitudes toward Mobile Websites," *CHI '14: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 2014, pp. 111-114, at p. 114. Similarly, less than a quarter of Mozilla Firefox and Google Chrome users chose to ignore their "browser's malware and phishing warnings." *See* Akhawe, Devdatta, and Adrienne Porter Felt, "Alice in Warningland: A Large-Scale Field Study of Browser Security Warning Effectiveness," *Usenix Security Symposium*, 2013, pp. 257-272, at p. 270.

[897] [redacted] *See* Kleidermacher (Google) Deposition, p. 54. [redacted] *See* Kleidermacher (Google) Deposition, pp. 57-60. [redacted] *See* Porst (Google) Deposition, pp. 46-47.

[898] *See supra* footnote 78.

[899] Google, [redacted] GOOG-PLAY-000415076-078, at 076-077.

[900] Porst (Google) Deposition, pp.36-38 and 157 and 159.

[901] Porst (Google) Deposition, p. 40.

[redacted]

437. Thus, by erecting technological hurdles, which reduce the likelihood that consumers will sideload apps, Google has foreclosed competing app stores and developers from nearly all distribution through sideloading.

3. *Google Restricted Competition by Paying Developers for Parity Terms*

438. I showed above how Google's conduct foreclosed competitors from entry and expansion in the three key distribution channels by which app stores can reach Android users: the Google Play Store, preloading, and sideloading. I now show that Google also sought to cut off rival app stores' access to apps from high-value developers, which, in turn, cut off their access to high-value consumers, by offering incentive payments to developers. Again, as noted above, if a rival is

[902] Porst (Google) Deposition, p. 42 [redacted]

[903] Porst (Google) Deposition, pp.43-45 and 51.

[904] Porst (Google) Deposition, p. 45

[905] Porst (Google) Deposition, pp. 52-53.

[906] Porst (Google) Deposition, pp. 45-46.

[907] Porst (Google) Deposition, pp. 45-46.

foreclosed from a share of developers, then fewer developers would attract fewer consumers, and then fewer consumers would attract fewer developers, etc., thereby magnifying the effect of foreclosure due to indirect network effects.

439. Google's exploration of incentive payments to developers came in response to the competitive threat posed by Epic Games and Samsung. In August 2018, Epic announced it would not make Fortnite available on the Google Play Store but instead would distribute to users through the official Fortnite website.[908] According to Epic Games founder Tim Sweeney, there were two primary motivations for forgoing the Google Play Store in favor of direct distribution: (1) Epic wished to maintain a direct relationship with consumers; and (2) Epic believed Google's 30% commission was "disproportionate to the cost of the services these stores perform, such as payment processing, download bandwidth, and customer service."[909] In December 2018, Epic announced it would launch the Epic Games Store and Fortnite on PC and Mac, starting with a "hand-curated set of games," and then open up to "other games and to Android and other open platforms throughout 2019."[910] [redacted][911]

440. Subsequently, in December 2019, Epic announced it "intended to launch Fortnite on the Google Play Store, but with the request that Epic be exempt from Google's policy of taking 30% of all in-app purchases."[912] Google rejected those terms, stating: "We welcome any developer that

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[908] Statt, Nick, "Fortnite for Android will ditch Google Play Store for Epic's website," *The Verge*, available at https://www.theverge.com/2018/8/3/17645982/epic-games-fortnite-android-version-bypass-google-play-store.

[909] Statt, Nick, "Fortnite for Android will ditch Google Play Store for Epic's website," *The Verge*, available at https://www.theverge.com/2018/8/3/17645982/epic-games-fortnite-android-version-bypass-google-play-store.

[910] Sweeney, Tim, "Announcing the Epic Games store," *Epic Games*, December 4, 2018, available at https://www.unrealengine.com/en-US/blog/announcing-the-epic-games-store.

[911] [redacted] September 2018, GOOG-PLAY-000542827.R-852.R, at 828.R. *See also* Google, [redacted] December 2020, GOOG-PLAY-004146689.R-757.R, at 692.R and Email from Purnima Kochikar, Director of Apps and Games at Google Play, to Erin Crosby, Google, Sameer Samat, VP of Product Management at Google, "[redacted]" June 12, 2019, GOOG-PLAY-001877016.C-022.C, at 019.C.

[912] Morris, Seren, "'Fortnite' Rejected From the Google Play Store, How Can You Play 'Fortnite' on Android Devices?" Newsweek, December 12, 2019, available at https://www.newsweek.com/fortnite-google-play-store-rejected-android-devices-1476910.

recognizes the value of Google Play and expect them to participate under the same terms as other developers."[913] Epic clarified its stance, stating "Epic doesn't seek a special exception for ourselves; rather we expect to see a general change to smartphone industry practices in this regard."[914] [redacted][915]

441. [redacted] [redacted] [redacted] [redacted] [redacted][18]

442. [redacted][919]

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[913] Statt, Nick, "Google says it won't grant Fortnite and exemption to the Play Store's 30 percent cut," *The Verge*, December 9, 2019, available at https://www.theverge.com/2019/12/9/21003553/google-play-store-fortnite-epic-games-30-percent-cut-dispute.

[914] Statt, Nick, "Google says it won't grant Fortnite an exemption to the Play Store's 30 percent cut," *The Verge*, December 9, 2019, available at https://www.theverge.com/2019/12/9/21003553/google-play-store-fortnite-epic-games-30-percent-cut-dispute.

[915] Google, [redacted] July 19, 2018, GOOG-PLAY-007278690-740, at 691. *See also*, Rosenberg (Google) Deposition, p. 318.

[916] Google, [redacted] January 9, 2018, GOOG-PLAY-004509271-273, at 272 [redacted]. *See also* Vu, Linda, Brian Brazinski, Josh O'Connor, Shafiq Ahmed, [redacted] Google, February, 2018, GOOG-PLAY-000005203.R-312.R, at 208.R [redacted]

[917] Marchak, Mike, [redacted]" Google, June, 2019, GOOG-PLAY-003938581.R-614.R, at 582.R. *See also*, Marchak (Google) Deposition, pp. 105-106 and 117-119.

[918] Google, [redacted] July 19, 2018, GOOG-PLAY-007278690-740, at 691 and 694.

[919] *See* ¶¶ 402-407, *supra* [redacted] GOOG-PLAY-004502766.R-771.R, at 769.R.

443. [redacted][923]

444. [redacted]

[920] Email from Samir Sayigh, Google, to Lei Zhang, Google, Mike Marchak, Director of Play Partnerships, Strategy and Operations, at Google, [redacted] October 9, 2018, GOOG-PLAY-004595170-172, at 170-171; Google, GOOG-PLAY-000237792-797, at 792-793 and 795 and 797; Marchak (Google) Deposition, pp. 70-72 and 257-258. See also Google, [redacted] December, 2020, GOOG-PLAY-004146689.R-757.R, at 692.R-695.R and 709.R-713.R; Marchak (Google) Deposition, pp. 380-382 [redacted]

[921] Google, [redacted] GOOG-PLAY-004502766.R-771.R, at 769.R.

[922] Email from Lawrence Koh, Former Director and Global Head of Games Business Development at Google, to George Yousling, Google, [redacted] February 13, 2020, GOOG-PLAY-000928690-692, at 691. *See also* Koh (EA (formerly Google)) Deposition, p. 299 ([redacted].

[923] Google, [redacted] GOOG-PLAY-000464148-153, at 151.

[redacted][924] [redacted][925]

- [redacted]
- [redacted]
- [redacted]

445. [redacted][926] [redacted][927]

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[924] Google, [redacted] August 19, 2020, GOOG-PLAY-003335786.R-823.R, at 796.R.

[925] Email from Paul Gennai, Product Management Director at Google, to Samer Sayigh, Google, Shafiq Ahmed, Onetime Play Finance Director at Google, [redacted]" GOOG-PLAY4-004529823-825, at 824. *See also* Koh (EA (formerly Google)) Deposition, p. 141 [redacted] and p. 177 [redacted]

[926] Google, [redacted] December, 2020, GOOG-PLAY-004146689.R-757.R, at 694.R. *See also* Marchak (Google) Deposition, January 13, 2022, pp. 379-381; Email from Purnima Kochikar, Director of Apps and Games at Google Play, to Erin Crosby, Google, Jim Kolotouros, Vice President, Android Platform Partnerships at Google, [redacted] June 12, 2019, GOOG-PLAY-001877016.C-022.C, at 019.C.

[927] Google, [redacted] December, 2020, GOOG-PLAY-004146689.R-757.R, at 693.R. *See also* Email from Mike Herring, Google, to Ruth Porat, CFO at Google, [redacted] April 8, 2019, GOOG-PLAY-000000807-815, at 808 and 810; Marchak (Google) Deposition, January 13, 2022, pp. 379-381; and Koh (Google) Deposition, pp. 362-363 [redacted]

446. In a highly competitive market, most-favored-nations clauses in contracts may be beneficial, by reducing transaction or information costs.[928] However, in a market dominated by a single, entrenched firm that benefits from network effects, most favored nations clauses can be anticompetitive.[929] That is because to challenge such a firm, potential rivals must gain scale; and to gain scale they must attract customers away from the entrenched firm. In this market, a rival app store might attract users by giving developers lower commissions in exchange for exclusive content, features or functionality. Google has closed off this possibility, however, by paying developers in advance not to do it via parity clauses.

447. The exact benefits Google offered to each developer in the Games Velocity Program are custom and set forth in their specific addenda to the DDA. But the specific provisions at issue were common to all agreements. [redacted][930] [redacted]

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[928] Baker, Jonathan and Judith A. Chevalier, "The Competitive Consequences of Most-Favored-Nation Provisions," *Antitrust*, Vol. 27, No. 2, 2013, pp. 20-26, at p. 22 ("A frequently cited motivation for [most-favored-nations clauses] is to reduce transaction and negotiation costs.") and Salop, Steven C. and Fiona Scott Morton, "Developing an Administrable MFN Enforcement Policy," *Antitrust*, Vol. 27, No. 2, 2013, pp. 15-19, at p. 18 (listing market conditions under which most-favored-nations clauses "are less likely to raise antitrust concerns," including "smaller sellers that lack market power," "[u]nconcentrated markets," or "input with close substitutes").

[929] Salop, Steven C. and Fiona Scott Morton, "Developing an Administrable MFN Enforcement Policy," *Antitrust*, Vol. 27, No. 2, 2013, pp. 15-19, at p. 18 (stating that most-favored-nations clauses "are more likely to raise antitrust concerns" if they are "[p]rovided by large sellers with market power.") and Baker, Jonathan and Fiona Scott Morton, "Antitrust Enforcement Against Platform MFNs," *The Yale Law Journal*, Vol. 127, No. 8, 2018, pp. 2176-2202, at p. 2195 ("The adoption of platform MFNs is likely to harm competition through exclusion-absent efficiencies, because scale economies in platform operation typically create oligopoly markets that do not perform competitively. Platforms often benefit from strong scale economies in demand (network effects). They may also benefit from scale economies in supply. Exclusionary conduct that prevents a new entrant from gaining a toehold is particularly problematic when the market is likely to be concentrated").

[930] Google and Activision, [redacted] January 25, 2020, GOOG-PLAY-007273439-444, at [redacted] December 2, 2019, GOOG-PLAY-007335447-450, at [redacted] February 28, 2020, GOOG-PLAY-

[redacted][931]

448. [redacted][932] [redacted]

007273267-272, at [redacted] March 4, 2020, GOOG-PLAY-010662251-255, at [redacted] August 28, 2019, GOOG-PLAY-007273051-054, at § [redacted] October 28, 2019, GOOG-PLAY-007273160-164, at § [redacted] March 31, 2020, GOOG-PLAY-007273309-313, [redacted] July 24, 2020, GOOG-PLAY-007335476-481, at [redacted] November 5, 2019, GOOG-PLAY-007273168-172, at [redacted] November 6, 2019, GOOG-PLAY-007273234-238, at [redacted] July 29, 2020, GOOG-PLAY-007273358-362, a[redacted]" October 29, 2019, GOOG-PLAY-010661066-069, at [redacted] December 18, 2020, GOOG-PLAY-007335585-595, at [redacted] March 10, 2020, GOOG-PLAY-007847579-583, at [redacted] January 19, 2021, GOOG-PLAY-007335471-475, at [redacted] January 8, 2020, GOOG-PLAY-007273404-408, at [redacted]

[931] *Id.* at § [redacted]

[932] Google, [redacted] November 2017, GOOG-PLAY-000304837.R-892.R, at 840.R.

[933] Email from Junichi Monma, Google, to Marko Medenica, Google, Takeshi Kishimoto, Google, [redacted] April 12, 2017, GOOG-PLAY-003467770-773, at 772.

[redacted][934] [redacted][935]

449. [redacted][936] [redacted]"[937] [redacted][938]

450. [redacted][939] [redacted]

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[934] Google, [redacted] GOOG-PLAY4-007226588-592, at 591.

[935] Email from Yoshitsuga Hirotaka, Google, to Jamie Rosenberg, Vice President of Strategy and Operations (Platforms and Ecosystems Division) at Google, [redacted] May 15, 2017, GOOG-PLAY-000084963-964, at 964.

[936] Email from Junichi Monma, Google, to Marko Medenica, Google, Takeshi Kishimoto, Google, [redacted] April 12, 2017, GOOG-PLAY-003467770-773, at 770.

[937] Email from Junichi Monma, Google, to Marko Medenica, Google, Takeshi Kishimoto, Google, [redacted] April 12, 2017, GOOG-PLAY-003467770-773, at 771.

[938] Google and Mixi Inc., [redacted] November 21, 2019, GOOG-PLAY-007273259-262, at 260.

[939] Google, [redacted] February 19, 2020, GOOG-PLAY-007172256.R-266.R, at 256.R.

[redacted][940] [redacted][941]

451. [redacted][942] [redacted] [redacted] [redacted] [redacted] [redacted][945]

452. [redacted][946] [redacted]

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[940] Google, [redacted] February 19, 2020, GOOG-PLAY-007172256.R-266.R, at 256.R, 259.R. See also, [redacted] March 24, 2021, GOOG-PLAY-009214167-177, at 168-171; [redacted] June 27, 2021, GOOG-PLAY-011249830-841, at 832-836; [redacted] July 13, 2021, GOOG-PLAY-011249875-887, at 876-882; and [redacted] December 20, 2021, GOOG-PLAY-011250003-016.

[941] [redacted] March 24, 2021, GOOG-PLAY-009214167-177; [redacted] June 27, 2021, GOOG-PLAY-011249830-841; [redacted] July 13, 2021, GOOG-PLAY-011249875-887; and [redacted] December 20, 2021, GOOG-PLAY-011250003-016.

[942] Koh (Google) Deposition, p. 286

[943] Email from Lawrence Koh, Former Director and Global Head of Games Business Development at Google, to Google Personnel, [redacted] February 13, 2020, GOOG-PLAY-007035840-843, at 840. See also Koh (Google) Deposition, pp. 284-292.

[944] Google, [redacted] December 2020, GOOG-PLAY-004146689.R-757.R, at 694.R.

[945] [redacted] *See* Google, [redacted] December 2020, GOOG-PLAY-004146689.R-757.R, at 694.R.

[946] Google, [redacted] December 2020, GOOG-PLAY-004146689.R-757.R, at 707.R.

[redacted][947]

4. *Google Has Always Intended to Monopolize the Android App Distribution Market*

453. The anticompetitive purposes of Google's conduct have been evident from the beginning. Google promoted Android to the market as an "open" system that would foster choice and competition, implying that the best apps and phones—and app stores—would win. Though Google initially said it never intended to "monetize" Android, it ultimately did.

454. If Google had not intended to foreclose competition from competing app stores, it could have offered competing app stores the option of being available for download through the Google Play Store. However, Section 4.5 of the DDA—which Google requires developers to accept as a condition of publishing apps on Google Play—forbids developers from using the Google Play Store "to distribute or make available any Product that has a purpose that facilitates the distribution of software applications and games for use on Android devices outside of Google Play."[948] [redacted][949]

455. [redacted][950] [redacted][951] [redacted]

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[947] Koh (Google) Deposition, pp. 367-368.

[948] Google, "Google Play Developer Distribution Agreement," November 17, 2020, GOOG-PLAY-000053875-878, at 875, *available at* https://play.google.com/about/developer-distribution-agreement.html.

[949] Google, "Summary of Changes," GOOG-PLAY-000270597-600 [redacted]

[950] [redacted] GOOG-PLAY-000054841-848.

[951] Email from Dan Morrill, Google, to Jeffrey Sharkey, Google, [redacted] May 20, 2009, GOOG-PLAY-004283892-896, at 892.

[redacted]

Exhibit 66

[redacted]

Source: Google, [redacted] Q3 2014, GOOG-PLAY4-004530839-887, at 843.

[redacted][954] That provision has harmed competition in the real world. Several competitor app stores have sought to distribute their app store

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[952] Google, [redacted] Q3, 2014, GOOG-PLAY4-004530839-887, at 843.

[953] Google, [redacted] GOOG-PLAY-000218038-041, at 040 and Google, [redacted] September 9, 2014, GOOG-PLAY-000220592-598, at 596-597.

[954] Google, [redacted] September 9, 2014, GOOG-PLAY-000220592-598, at 594.

apps on Google Play, only for Google to block the app store from publication or remove it. Below I present two such examples, from the early days of Android.

457. ***Handango***. Handango was a third-party app store that distributed apps for early mobile phone platforms such as Blackberry, Windows Mobile, Palm,[955] and, eventually, Android. Handango announced its plans to launch an Android app store in the fall of 2008[956]. [redacted]"[957] [redacted][958]

458. [redacted][959] In 2010, Handango was acquired by the app store company PocketGear, "creating the

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[955] Games Industry International, "First Half 2008 Handango Yardstick," September 23, 2008, available at https://www.gamesindustry.biz/first-half-2008-handango-yardstick-data-on-the-most-popular-smartphone-apps-with-games-topping-the-charts.

[956] Ray, Bill, "Handango cashes in on Android," The Register, October 2, 2008, available at https://www.theregister.com/2008/10/02/handango_android/.

[957] Email from Dan Morrill, Google, to Meghan Hughes, Google, Hiroshi Lockheimer, Senior Vice President of Platforms & Ecosystems at Google, [redacted] September 30, 2008, GOOG-PLAY-001382685-689, at 687.

[958] Email from Dan Morrill, Google, to Meghan Hughes, Google, Hiroshi Lockheimer, Senior Vice President of Platforms & Ecosystems at Google, [redacted] September 30, 2008, GOOG-PLAY-001382685-689, at 687.

[959] Email from Dan Morrill, Google, to David Conway, Google, [redacted]" May 19, 2009, GOOG-PLAY-001090916-918, at 916 [redacted]

world's largest cross-platform mobile application store."[960] In 2011, the combined store rebranded as Appia but then exited the third-party app store business to focus on designing white-label app stores for carriers and OEMs.[961]

459. ***Amazon***. On September 9, 2014, Amazon launched a version of the Amazon App that gave consumers "access to Amazon's digital products and services, including unlimited streaming of tens of thousands of movies and TV episodes at no additional cost for Prime members."[962] Amazon explained that "[a]fter updating their existing Amazon App for Android, customers wishing to stream Prime Instant Video movies and TV episodes can install the Prime Instant Video players app, which is delivered exclusively via the Amazon Appstore."[963] Amazon confirmed this release was also offering "the ability for customers to purchase videos, songs, audiobooks, *apps and games* from within the Amazon App" directly.[964]

460. [redacted][965] [redacted]

[960] The app store was cross-platform in the sense that it offered apps "for users of Android, Symbian, BlackBerry, Windows Mobile, Palm, Linux and Java handsets." See Meyer, David, "PocketGear buys Handango to create giant app store," *ZDNET*, February 24, 2010, available at https://www.zdnet.com/home-and-office/networking/pocketgear-buys-handango-to-create-giant-app-store/.

[961] Rao, Leena, "PocketGear Rebrands To Appia; Shifts To White-Label App Marketplace Platform," TechCrunch, February 3, 2011, available at https://techcrunch.com/2011/02/03/pocketgear-rebrands-to-appia-shifts-to-white-label-app-marketplace-platform/.

[962] Amazon, "Prime Instant Video Now Available on Android Phones — Exclusively Via the Amazon Appstore," September 9, 2014, available at https://press.aboutamazon.com/news-releases/news-release-details/prime-instant-video-now-available-android-phones-exclusively.

[963] Amazon, "Prime Instant Video Now Available on Android Phones — Exclusively Via the Amazon Appstore," September 9, 2014, available at https://press.aboutamazon.com/news-releases/news-release-details/prime-instant-video-now-available-android-phones-exclusively.

[964] Perez, Sarah, "Google Removes Amazon's App Listing from Google Play Search Following Addition of Appstore, Instant Video Integrations," *TechCrunch*, December 11, 2014, available at https://techcrunch.com/2014/12/11/google-removes-amazons-app-listing-from-google-play-search-following-addition-of-appstore-instant-video-integrations/ (emphasis added).

[965] Email from Atul Kumar, Google, to Sarah Karam, Google, Kevin Wang, Operations Consultant at Google, [redacted]" September 9, 2014, GOOG-PLAY4-007215136.R-39.R, at 38.R.

[redacted][966] Approximately two weeks after Amazon's new app version went live, Google released the new DDA Section 4.5 language precluding all developers from distributing or making available "any Product that has a purpose that facilitates the distribution of software applications and games for use on Android devices outside of Google Play."[967]

461. [redacted][969] [redacted][970]

462. [redacted][971]

5. Google Used its Valuable Advertising Programs to Restrict Competition from Rival App Stores

463. Google used its valuable advertising campaigns as another means to foreclose competing app stores, by forcing app developers to distribute through the Google Play Store in order to use its advertising campaigns to promote their apps. Google's Universal App Campaigns

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[966] Google, [redacted]" GOOG-PLAY-004713191-194, at 192.

[967] Google, "Google Play Developer Distribution Agreement," November 17, 2020, GOOG-PLAY-000053875-878, at 875, available at https://play.google.com/about/developer-distribution-agreement.html

[968] [redacted] November 12, 2014, GOOG-PLAY-000830885.R-889.R, at 887.R-888.R; see also Google, [redacted] November 11, 2014, GOOG-PLAY-009580959-962.

[969] Email from Sarah Karam, Google, to Aaron Rova, Google, [redacted] December 26, 2014, GOOG-PLAY-007135039.

[970] Email from Kevin Wang, Operations Consultant at Google, to Larissa Fontaine, Google, [redacted] December 13, 2014, GOOG-PLAY-000831600-606, at 600; 9to5 Google, "Google forces removal of Amazon app from Play Store over hidden app store," December 11, 2014, available at https://9to5google.com/2014/12/11/google-amazon-app-store/.

[971] GOOG-PLAY-000469931.

allows app developers to "get your app into the hands of more paying users" by "streamlin[ing] the process" and "making it easy" for developers "to promote your apps across Google's largest properties."[972] [redacted][973] Therefore, developers who choose to offer their apps on a competing app store – and therefore forego offering their apps on the Google Play Store pursuant to the DDA section 4.5 – cannot access Google's App Campaigns.

464. App Campaigns is a key means to reach potential consumers.[974] Types of Google App Campaigns include app installs, which "[r]un ads that encourage people to install your app," "automates targeting and bidding," and allows developers to focus ads "on finding valuable users based on actions [they] care about, like in-app conversions"; app engagement, which "[e]ngage users who already [the developer's] app and take[s] them to a targeted landing page"; and app pre-registration, which "[r]un[s] ads that build excitement and awareness for … apps and games before they release on Google Play."[975]

465. Google App Campaigns provide many useful services to app developers and advertisers. For example, Google App Campaigns streamline the process for app advertisers to connect with paying users by helping to promote apps across Google properties including Search, Google Play, YouTube, Discover on Search, AdMob, the Google Display Network, Google's search partners, and other publishers who host app ads.[976] Google uses the advertiser's text ideas, images, videos, and assets to "design a variety of ads across several formats and networks," thereby eliminating the need for the advertiser or developer to create individual ads for App campaigns.[977]

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[972] *See* Google, "About App Campaigns," available at https://support.google.com/google-ads/answer/6247380?hl=en.

[973] Google, "2021.09.10 – Defendants' Supplemental Responses and Objections to Epic's Second Set of Interrogatories (002).pdf," September 10, 2021, p. 15.

[974] Google, "Find the people who will love your app," available at https://ads.google.com/home/campaigns/app-ads/.

[975] Google, "About App Campaigns," available at https://support.google.com/google-ads/answer/6247380?hl=en.

[976] Google, "About App Campaigns," available at https://support.google.com/google-ads/answer/6247380?hl=en.

[977] Google, "About App Campaigns," available at https://support.google.com/google-ads/answer/6247380?hl=en ("To get started, all you need to do is provide some text, a starting bid and budget, and let us know the languages and locations for your ads. We also strongly recommend that you provide at least one landscape image, one portrait video, and one landscape video, and where relevant, HTML5 assets. Our systems will test different asset combinations and serve ads that are performing the best more often, with no extra work needed from you").

Apps Campaigns allow advertisers to access a record of changes to app campaigns with annotations on the performance chart to see how those changes might have impacted performance[978] and also offer free appointments with an Ads expert to provide support in crafting media strategies.[979] Google thus discourages Android App Distribution competition by limiting Google App Campaigns to developers who offer their Android apps exclusively on the Google Play Store.

B. Google's Anticompetitive Conduct in the Android App Distribution Market Has Allowed it to Impose Supracompetitive Commissions

466. Google's anticompetitive restrictions with regard to Android App Distribution has allowed it to charge supracompetitive commissions. As explained in Section VI.A.1, with few exceptions, Google has charged a 30 percent commission for paid apps and in-app digital content sold through Google Play's billing system.[980] In the following section, I show that the fee would have been lower under a competitive but-for world in which Google did not monopolize the Android App Distribution Market. Moreover, I find that fees in the but-for world would be lower in both the Android App Distribution and In-App Billing Services Markets, as enhanced competition on the Android App Distribution Market would make any anticompetitive tying arrangement on the Android In-App Billing Services Market ineffective, thereby allowing for competition in the latter market as well.

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[978] Google, "About App Campaigns," available at https://support.google.com/google-ads/answer/6247380?hl=en.

[979] Google, "About App Campaigns," available at https://support.google.com/google-ads/answer/6247380?hl=en and Google, "Find the people who will love your app," available at https://ads.google.com/home/campaigns/app-ads/.

[980] Google Play Console Help, Service fees, available at https://support.google.com/googleplay/android-developer/answer/112622?hl=en&visit_id=637872098045257136-3276584470&rd=1. There are a few exceptions: (i) starting July 1, 2021, the service fee "for each developer will be 15% for the first $1M (USD) of earnings you make each year when you sell digital goods or services;" (ii) for automatically renewed subscriptions the service fee is 15 percent; (iii) "As of December 18, 2021, for developers who offer an alternative in-app billing system in addition to Google Play's billing system for transactions with users in South Korea… the service fee for such transactions using the Additional Billing System is equal to the service fee applicable for transactions via Google Play's billing system reduced by 4%." *See also* Google Play Console Help, Changes to Google Play's service fee in 2021, available at https://support.google.com/googleplay/android-developer/answer/10632485.

1. *Google Has Charged Commissions Substantially Above Its Marginal Costs and Has Offered Lower Rates on Several Occasions*

467. [redacted][981] All of these facts indicate that Google has charged a supracompetitive commission that is substantially above marginal costs.

468. [redacted].[982] [redacted]

[981] [redacted] GOOG-PLAY-007819776-064, at 861; Cramer (Google) Deposition, pp. 392-393. *See also* Marchak (Google) Deposition, pp. 98-102, and associated exhibit (Email from Rashad Sharif, Google, to Felix Hu, Google, Mike Marchak, Director of Play Partnerships, Strategy and Operations, at Google, [redacted] April 22, 2019, GOOG-PLAY-000934740-742, at 740) [redacted] *See also*, Email from Justin Mattson, Senior Software Engineer at Google, to Dan Morrill, Google, and Eric Chu, Google, [redacted] December 17, 2009, GOOG-PLAY-001677481-484, at 481 [redacted]

[982] *See, e.g.*, "Defendant Google's Answers and Objections to Developer Plaintiff's First Set of Interrogatories," United States of America, Google Play Store Developer Antitrust Litigation, Case No. 3:20-cv-05792-JD, July 6, 2021, at pp. 13-16. *See also* Google, [redacted] GOOG-PLAY-006409808-820; Google, [redacted] GOOG-PLAY-003896481-482; and Google, [redacted] July 20, 2020, GOOG-PLAY-003330554-558.

[redacted] Since many of these programs pertain to commissions for in-app content, I discuss these programs further in Section VIII.B below.

469. The evidence above indicates Google's ability and willingness to substantially decrease commissions in the face of the threat by certain developers to distribute their apps outside the Google Play Store (or not use Google Play Billing), as discussed above, or other goals related to growth and success of its business, thereby indicating that Google's 30% commission is supracompetitive. Nonetheless, such programs are limited, thereby demonstrating Google is able to broadly maintain its market power. [redacted][984] [redacted]

470. [redacted]

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[983] *See,* e.g., "Defendant Google's Answers and Objections to Developer Plaintiff's First Set of Interrogatories," United States of America, Google Play Store Developer Antitrust Litigation, Case No. 3:20-cv-05792-JD, July 6, 2021, at pp. 14-16. [redacted] GOOG-PLAY4-001404993 – 5001, at 4993-994.

[984] Letter from Brian C. Rocca to Yonatan Even, September 23, 2022, pp. 1-2.

[985] *See,* e.g., Google, [redacted] GOOG-PLAY-007819776-064, at 785. *See also* Cramer (Google) Deposition, pp. 384-388.

[redacted]

Exhibit 67

[redacted]

Note: The data includes worldwide developers. All transactions relate to U.S. consumer transactions.

Source: Google Transaction Data.

471. [redacted]

[986] Since the transaction level data produced by Google only relate to purchases in the U.S., I am unable to extend this analysis to purchases worldwide excluding China.

[redacted][987] [redacted][989]

2. Competitive But-For World Commission

472. As the evidence above indicates, (i) Google's 30 percent commission is supracompetitive; and (ii) Google was able and willing to substantially decrease commissions in the face of competitive pressures or other goals related to growth and success of its business. Thus, it is

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[987] *See* Google, [redacted] January 26, 2009, GOOG-PLAY-004630018.R-032.R, at 024.R; *See also* Google, GOOG-PLAY-004506631-633, at 631 [redacted] *See also* Google, [redacted] March 22, 2019, GOOG-PLAY-000565541.R-562.R, at 552.R [redacted]

[988] Google, [redacted] May, 2019, GOOG-PLAY-004504494.R-506.R, at 495.R and 499.R [redacted]. *See also* Cramer (Google) Deposition, pp. 374-376.

[989] Google, GOOG-PLAY-009292321-357, at 329 [redacted]; Google, [redacted] GOOG-PLAY-007819776-064, at 785 [redacted] *See also* Cramer (Google) Deposition, pp. 384-388; Google, [redacted] April 14, GOOG-PLAY-006829073.R-172.R, at 157.R and 170.R-171.R [redacted] *See also* Marchak (Google) Deposition, pp. 473-475 [redacted] Email from Sameer Samat, Vice President of Product Management at Google, to Hiroshi Lockheimer, Senior VP of Platforms & Ecosystems at Google, [redacted] August 1, 2017, GOOG-PLAY-009911010-012, at 011 [redacted] November 16, 2020, GOOG-PLAY-006990552-571, at 555 [redacted]

my opinion that, in a competitive but-for world in which Google did not monopolize the Android App Distribution Market—and hence did not foreclose the market to competitor Android distribution methods—there would be enhanced competitive pressure on Google. Developers and users would have more Android App Distribution alternatives from which to choose and potentially switch. As a result, commission would be lower than 30%.

473. The lower commissions that Google has offered to various developers over time, as described above, serve as upper bounds on what the commissions would look like in a competitive but-for world. In the competitive but-for world, competitive pressure on Google would be what Google has faced so far in the actual world plus additional pressure due to enhanced competition. In addition, the commissions would be lowered on both Android App Distribution and In-App Billing Services Markets as enhanced competition on the Android App Distribution Market would make any anticompetitive tying arrangement on the In-App Billing Services Markets ineffective and hence would allow for competition in that market as well.

474. I find that an upper bound on a commission in the Android App Distribution Market in a but-for world in which Google does not monopolize the Android App Distribution Market would be 15%. Furthermore, enhanced competition on the Android App Distribution Market would make any anticompetitive tying arrangement on the Android In-App Billing Services Markets ineffective and as a result an upper bound commission in the Android In-App Billing Services Market would also be 15%.

475. In Section VIII.B.2, I discuss why 15% is a conservative estimate of upper bound on the but-for commission in the Android In-App Billing Services Market in a but-for world in which Google has monopoly in the Android App Distribution Market but does not pursue an anticompetitive tying strategy. If Google, in addition, faced competition in the Android App Distribution Market, then the commission would reduce further thus making 15% a conservative estimate. In addition, with few exceptions, Google sets the same commissions on the two markets in the actual world. Thus, I find the commissions would likely not be different on the two markets in a but-for world in which Google faced competition in the Android App Distribution Market.

3. *Competitive But-For World Commissions Are In-Line with Commissions on Other App Stores*

476. I also evaluate whether this competitive but-for world commission is in line with commissions in other app stores, including PC app stores and alternative mobile app stores. [redacted][990] [redacted][991] These commissions are bounded above by Google's commission of 30 percent and the lower commissions are in-line with the commissions that Google has offered to various price sensitive developers over time.

Exhibit 68
PC App Store Commissions

App Store	Timeline	Commission
Chrome Web Store	2011 - present	1) 5% commission if using Chrome Web Store API to charge for features or virtual goods. 2) 30% commission for in-app payments for ARC (Android Runtime for Chrome) apps.
Epic Games Store	1) 2018 - present 2) 2018 - present	1) 12% commission for all games. 2) 5% licensing fee waived for games using Epic's Unreal Engine.
Microsoft Store	1) - present 2) 2019 - present 3) 2021 - present 4) 2021 - present	1) 30% commission for Xbox console games. 2) 5% commission for non-game and non-Xbox apps when users download an app through a direct URL. 3) 12% commission for PC games. 4) no commission for apps using a third party payment processor.
Steam	1) 2018 - present 2) 2018 - present 3) 2004 - present	1) 20% commission for every sale in excess of $50 million. 2) 25% commission for every sale between $10 and $50 million. 3) 30% for all other sales.
Game Jolt Store (Desktop)	present	0-10% commission set by the developer.

Source: *See* Appendix G.

[990] Google, "Play Business Model Thoughts," GOOG-PLAY-000565541.R-562.R, at 558.R; Google, "Exploring new business models," March, 2019, GOOG-PLAY-000542516.R-535.R, at 529.R-530.R.

[991] For more detailed information, *see* Appendix G.

477. The competitive dynamics among PC app stores provide an insight into how competition can drive commissions down below 30 percent and highlights the ability and willingness of app stores to aggressively compete on commissions in response to competitive pressures. For example, in December 2018, Epic launched its PC store and offered 12 percent commission to developers.[992] The same month, Steam decreased its commission from flat 30 percent to "30 percent cut on sales under $10 million, then a 25 percent cut on sales between $10 million and $50 million, then a 20 percent cut on sales above $50 million."[993] Shortly after, in early 2019, Discord instituted "a reduced, 10-percent cut from game revenues generated on its online store … one-upping the Epic Games Store and its recently announced 12-percent cut on the Epic Games Store."[994] Following that, in March 2019, the Microsoft Store decreased its commission to tiers of 5 and 15 percent, from 30 percent, for "app purchases on Windows 10 PCs, Windows Mixed Reality, Windows 10 Mobile and Surface Hub devices."[995] A few months later, in late 2019, Epic permitted developers and publishers who offered in-game purchases to use payment platforms other than Epic's payment platform and, if they did so, would pay no commission to Epic.[996] Two years later, in the summer of 2021, the Microsoft Store likewise gave app developers an option "to bring their own or a third party commerce platform in their apps," which would allow those developers to avoid paying Microsoft a commission.[997] Around this time, the Microsoft Store

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[992] Epic Games, "The Epic Game Store is Now Live," December 6, 2018, available at https://store.epicgames.com/en-US/news/the-epic-games-store-is-now-live.

[993] Dillet, Romain, "Valve changes revenue-sharing tiers on Steam," *TechCrunch*, December 3, 2018, available at https://techcrunch.com/2018/12/03/valve-changes-revenue-sharing-tiers-on-steam/?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAALppmkBDcQzTmcmVRIAQ--JnZtWxEuQY6XBKIWKQYhgZ4LSXPsSQedJ3Jezb8w7pQpoaGNvI5zLtcAdidglTKOAEnZ6hR7lhjmrzXfxAjthmUXXKtBtx1I9n1bZYuTi1EHXeNt669ERH0ZM5jReT-1BrJ6ecL3kO-XXYCevOTJez.

[994] Orland, Kyle, "Discord Store to offer developers 90 percent of game revenues," December 14, 2018, available at https://arstechnica.com/gaming/2018/12/discord-store-to-offers-developers-90-percent-of-game-revenues/#:~:text=Discord%20has%20announced%20that%20it,on%20the%20Epic%20Games%20Store.

[995] Miller, Chance, "Microsoft updates Store revenue split to give developers a 95% cut, but with limitations," *9to5Mac*, March 6, 2019, available at https://9to5mac.com/2019/03/06/microsoft-store-revenue-share/.

[996] Nguyen, Lisa, "Epic Games Store Gives Developers and Publishers More Choices For In-Game Payment Options," *Happy Gamer*, December 9, 2019, available at https://happygamer.com/epic-games-store-gives-developers-and-publishers-more-choices-for-in-game-payment-options-45712/.

[997] Sardo, Giorgio, "Building a new, open Microsoft Store on Windows 11," *Microsoft*, June 24, 2021, available at https://blogs.windows.com/windowsexperience/2021/06/24/building-a-new-open-microsoft-store-on-windows-11/.

decreased its commission for games from 30% to 12%.[998] Those changes reflect how, in a market that is a two-sided platform with indirect network effects, prices are driven down by competition.

478. Finally, Exhibit 69 shows the commissions offered by alternative Android app stores. Those commissions are generally below 30 percent, which provides yet another indication that mobile app stores are able and willing to decrease their commissions below 30%.

Exhibit 69
Alternative Android App Store Commissions

App Store	Timeline	Commission
ONE Store	1) 2018 - present 2) 2020 - 2021	1) 20% commission and 5% for developers with their own payment methods. 2) 50% discount in commission for developers earning less than $5 million in monthly transactions.
Amazon Appstore	1) - present 2) 2018 - present 3) 2018 - present 4) 2021 - present	1) 30% commission for mobile apps and in-app products. 2) 20% commission for movie and TV subscription products sold in mobile apps and 30% commission for non-movie and non-TV subscription products sold in mobile apps. 3) The lower of 30% commission or 80% of the list price for PC software/games and in-app products. 4) Small Business Accelerator Program: 20% commission for developers earning less than $1 million in the previous calendar year. Additionally, developers will receive 10% of revenue in AWS promotional credits.
Aptoide	present	4-25% commission for in-app transactions.
Galaxy Store	present	30% commission that can be negotiated with Samsung.
Game Jolt Store (Mobile)	present	0-10% commission set by the developer.

Source: See Appendix H.

479. As illustrated above, commissions on PC app stores and alternative Android app stores are bounded by Google's commission of 30 percent and the lower commissions are in-line with the commissions that Google has offered to various price-sensitive or important developers over time. In addition, the observed competitive dynamic among PC stores illustrates how competition can drive commissions down below 30 percent and demonstrates the ability and willingness of app stores to compete aggressively on commissions in response to competitive pressures.

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[998] Warren, Tom, "Microsoft shakes up PC gaming by reducing Windows store cut to just 12 percent," *The Verge*, April 29, 2021, available at https://www.theverge.com/2021/4/29/22409285/microsoft-store-cut-windows-pc-games-12-percent.

4. Direct Discounts to Consumers

480. In a world absent Google's anticompetitive conduct, I find there likely would have been increased discounts to consumers. Providing direct discounts to consumers is an effective way to retain or acquire consumers when faced with competitive pressures. Other app stores have recognized this and have offered discounts to consumers in the face of competitive threats.

481. For example, as discussed in Section IV.A.6, in September 2018, Google launched Google Play Points, a consumer loyalty rewards program that allows users to earn points on their Google Play purchases and redeem them for content in the Google Play Store, thereby providing discounts directly to consumers.[999] Google initially launched Google Play Points in Japan, followed by South Korea approximately six months later and roughly one year after the regulatory change in South Korea and ONE store's subsequent reduction of its commission to 20% (or 5% if developers choose their own billing service provider).[1000] Google eventually rolled out the Play Points consumer rewards program to over 22 markets, launching in the U.S. in November 2019.[1001]

482. [redacted][1002] [redacted]

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[999] *See* Google, "Google Play Points," available at https://play.google.com/console/about/googleplaypoints/; Schoon, Ben"Google Play Points rewards program goes official, only works in Japan for now," *9to5Google,* available at https://9to5google.com/2018/09/18/google-play-points-official-rewards-program-japan/.

[1000] Na, Hyun-joon and Minu, Kim, "Korean app market One Store vows to go global in 2022 with more popular games," *Pulse*, August 24, 2021, available at https://pulsenews.co.kr/view.php?year=2021&no=816068.

[1001] *See* Schoon, Ben, "Google Play Points rewards program goes official, only works in Japan for now," 9to5Google, available at https://9to5google.com/2018/09/18/google-play-points-official-rewards-program-japan/; Mu-Hyun, Cho, "Google Play introduces reward points in South Korea," *ZDNet*, April 22, 2019, available at https://www.zdnet.com/article/google-play-introduces-reward-points-in-south-korea/; Mok, Winston, "Google Play Points: a rewards program for all the ways you Play," *Google,* November 4, 2019, available at https://www.blog.google/products/google-play/google-play-points-rewards-program-all-ways-you-play; Google, "Google Play Points: Frequently Asked Questions," available at https://play.google.com/console/about/programs/googleplaypoints/.

[1002] *See, e.g.*, Google, [redacted] October 28, 2020, GOOG-PLAY-002650052.R-138.R, at 076.R [redacted] *See also* Google, "Play Points," December 5, 2018, GOOG-PLAY-000953420.R-460.R, at 422.R [redacted] and Google, "Google Play Points Developer Overview," May 2019, GOOG-PLAY-000518034.R-071.R, at 037.R.

[redacted][1003] [redacted][1004] As described in Section IV.A.6, transactions earning Play Points grew steadily after its introduction, both in transaction volume and revenue. Moreover, the number of Android users enrolled in Play Points has also steadily increased, and the average spending by consumers enrolled in Play Points is higher than those not enrolled in the loyalty program.

483. [redacted][1006]

484. Further, "One Store, for example, has also been offering promotions targeting consumers. As well as discount coupons, One Store offered cashback events, giving refunds of 30 to 50 percent on total transactions inside certain gaming apps. The number of people who purchased gaming apps through One Store in the third quarter increased by 19 percent compared to the same period a year earlier as a result."[1007] Similarly, Aptoide has a digital currency system called

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[1003] Google, [redacted] December 5, 2018, GOOG-PLAY-000953420.R-460.R, at 422.R.

[1004] Google, [redacted] GOOG-PLAY-000302766-867, at 864 (emphasis in original).

[1005] Google, [redacted] February, 2018, GOOG-PLAY-001284083.R-162.R, at 086.R (emphasis in original).

[1006] Google, [redacted] April, 2017, GOOG-PLAY-000879194.R-224.R, at 204.R (emphasis in original).

[1007] Kim Jung-Min, Chea Sarah, "One Store gains ground in local Android app market," *Korea JoongAng Daily*, December 2, 2020, available at https://koreajoongangdaily.joins.com/2020/12/02/business/industry/One-Store-app-market-Google/20201202175300439.html.

AppCoins, which is used for in-app transactions and gives up to 20% bonus to customers across all purchases.[1008]

485. In 2022, Samsung offered a 30% discount to consumers for purchases from the Galaxy Store of at least $2. Consumers could claim a maximum of 10 coupons in 24 hours. "Additionally, users who spend more throughout the promotion" were offered "exclusive benefits," including "a $3 coupon when you purchase something worth $3.99 or more." As PhoneArena points out, you can get a 20% discount coupon on your first purchase and a 30% discount on your third purchase. And finally, when you reach a total purchase of $300, you will get a 99% coupon upon checkout."[1009]

486. Thus, in a world absent Google's anticompetitive conduct in which it faced competitive pressures throughout the relevant time period, it is my opinion that Google would have provided direct discounts to consumers, such as its Play Points loyalty reward program, earlier than it did in the actual world and with likely more generous rewards. However, in my model, I conservatively assume that Google would have launched such a program within approximately one year following the introduction of the Google Play Store, based on the example of Google launching Play Points in South Korea in response to ONE store's subsequent commission reduction, as described above.[1010] Moreover, I have also assumed that the direct to consumer price discount from Play Points in the but-for world would be *at a minimum* comparable to the price discounts observed in the actual world. However, these assumptions about direct to consumer discounts are highly conservative. Under greater competition, Google's discounts to consumers would likely be much more generous, as with other consumer discount programs offered by alternative Android app

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[1008] Aptoide, "AppCoins," available at https://appcoins.io/; AppCoins, "Everything you need to know about AppCoins Credits [Updated]," April 12, 2019, available at https://appcoins.medium.com/everything-you-need-to-know-about-appc-credits-a9f3b5855071#:~:text=Our%20User%20Incentive%20Programs%20allow,their%20in%2Dapp%20spending%20level.

[1009] Everton, Jordan "Samsung offering 30% discount on purchases made from The Galaxy Store," *Wirefly*, May 2, 2022, available at https://www.wirefly.com/news/samsung-offering-30-discount-purchases-made-galaxy-store.

[1010] Given the damages period starts August 16, 2016, damages would be unaffected even if I assumed that, in the but-for world, Google started a loyalty reward program any time within about four years after the introduction of the Google Play Store. Given it launched Play Points in South Korea within one year following the regulatory change and ONE store's subsequent reduction of its commission, I find a launch date within four years to be reasonable.

stores described above, and these discounts may have started even earlier than approximately one year after the launch of the Google Play Store, rather than in November 2019 as it did in the actual world. Thus, though Google may have launched a consumer discount program even sooner after launch of the Google Play Store in a competitive world and provided even more generous discounts than it did in the actual world, I, nonetheless, use this start date and the actual-world discount levels as conservative assumptions of the direct- to -consumer discounts in a world absent Google's challenged conduct. Using Google's transaction data, I estimate the average price discount due to Play Points as the total value of Play Points during the period 2020-2021, calculated as 100 Play Points equaling a $1 discount, divided by the total gross consumer spend in the Google Play Store.

C. Google's Anticompetitive Conduct in the Android App Distribution Market Has Lowered Output and Harmed Innovation

487. In addition to allowing Google to charge supracompetitive commissions, I find that Google's anticompetitive conduct in the Android App Distribution Market has also resulted in reduced output and innovation. In a competitive but-for world, in which Google did not monopolize the Android App Distribution Market, there would be higher output and greater innovation. As I explain in Section IX.A and derive it in my model in Appendix F, the output would be higher because more developers would be willing to enter the market as their expected profits from doing so would be higher given the lower commissions and higher direct discounts to consumers set by Google. This would translate into increased supply (*i.e.,* more apps and in-app content available

from developers).[1011] Consequently, there would be lower equilibrium price and higher equilibrium output.[1012]

488. To demonstrate that output would be higher in a world absent Google's anticompetitive restrictions, I estimate but-for output (product quantity) using a model of competition between apps in which developers supply apps and in-app content and compete on prices charged to consumers. The model also has free entry of apps, which determines the number of apps entering an app store. The model is developed and explained in more detail in Appendix F and discussed in Section IX.A. First, I estimate the increase in the number of apps. I estimate that the number of apps would increase by about 20%.[1013] Second, I estimate the equilibrium output in the but-for world in each year from August 16, 2016 to May 31, 2022.[1014] Exhibit 70 shows the actual and but-for output for each year from August 16, 2016 to May 31, 2022. The weighted average increase in output from the actual to the but-for world across this time period is about 20%.[1015]

[1011] Mankiw, N. Gregory, Principles of Microeconomics, Fifth Edition, Mason, OH: South-Western CENGAGE Learning, 2008 (hereafter "Mankiw (2008)"), pp. 304-305. It has been shown that reduction in cost or increase in demand can lead to more entry and large benefits to consumers. *See e.g.* Janßen, Rebecca, Reinhold Kesler, Michael E. Kummer, and Joel Waldfogel, "GDPR and the Lost Generation of Innovative Apps," NBER Working Paper Series, 2022 (hereafter "Janßen et al (2022)"), pp. 1 and 22; Church, Jeffrey and Neil Gandal. "Complementary network externalities and technological adoption," *International Journal of Industrial Organization* 11, 1993, pp. 239-260 (hereafter "Church and Gandal (1993)"). In general, analyzing or quantifying the benefits of variety to consumers is common in the economics literature. *See*, *e.g*., Dixit, Avinash K. and Joseph E. Stiglitz, "Monopolistic Competition and Optimum Product Diversity," *The American Economic Review*, Vol. 67, No. 3, 1977, pp. 297-308 (hereafter "Dixit and Stiglitz (1977)"); Petrin, Amil, "Quantifying the Benefits of New Products: The Case of the Minivan," *Journal of Political Economy*, Vol. 10, No. 4, August 2002 (hereafter "Petrin (2002)"); Brynjolfsson, Erik, Yu (Jeffrey) Hu, and Michael D. Smith, "Consumer Surplus in the Digital Economy: Estimating the Value of Increased Product Variety at Online Booksellers," *Management Science*, Vol. 49, No. 11, 2003, pp. 1580-1596 (hereafter "Brynjolfsson et al (2003)").

[1012] *See* Appendix F where I develop a model underlying my damages calculations. The model provides a mechanism through which lower service fee translates into increased supply of apps and in-app content, resulting into lower equilibrium price and output.

[1013] *See* Rysman Workpapers.

[1014] Note that this estimation is performed under a conservative assumption that there is only a direct effect of commission on app and in-app content price. For the discussion of direct effect of commission on price, in my model, *see* Section IX.A.1.

[1015] *See* Rysman Workpapers.

Exhibit 70

[redacted]

Source: Google Transaction Data.

489. Google's internal documents and testimony also acknowledge the positive effects of lowering Google's commissions on output, choice, and innovation. In a blog post, Sameer Samat, Vice President Product Management at Google, stated that "[s]tarting on July 1, 2021 we are reducing the commission Google Play receives when a developer sells digital goods or services to 15% for the first $1M (USD) of revenue every developer earns each year. With this change, 99% of developers globally that sell digital goods and services with Play will see a 50% reduction in fees. **These are funds that can help developers scale up at a critical phase of their growth by hiring more engineers, adding to their marketing staff, increasing server capacity, and more.**"[1016]

490. [redacted]

[1016] Samat, Sameer, "Boosting developer success on Google Play," *Google*, March 16, 2021, available at https://android-developers.googleblog.com/2021/03/boosting-dev-success html (emphasis added).

[redacted][1017]

491. [redacted][1018]

492. Further, economic literature suggests that new apps that would enter the market as a result of enhanced competition and concomitant lower commissions would not be low-quality apps. A study by Janßen et al (2022), of the impact of the General Data Protection Regulation (GDPR), enacted by EU in May 2018, which imposes a series of rules intended to increase consumer security and privacy,[1019] found that entry of high-quality apps on the Google Play Store after enactment of GDPR fell by about 40 percent, about the same as low-quality apps.[1020] The post-GDPR decline in entry "reduced the number of both ex post successful and ex post unsuccessful apps … [T]his provides strong evidence that app success is unpredictable, so that an entry reduction can deliver large welfare impacts."[1021] Indeed, the authors found that "GDPR reduces the quarterly CS [consumer surplus] from $45.0 billion to $30.6 billion, or by 31.93 percent" and conclude "[w]hatever the benefits of GDPR's privacy protection, it appears to have been accompanied by substantial costs to consumers, from a diminished choice set, and to producers from depressed revenue and increased costs."[1022] Hence, imperfect predictability of app quality, before its entry,

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[1017] Samat, Sameer, [redacted] February 22, 2021, GOOG-PLAY-002358233-240, at 236 (emphasis added).

[1018] Google, [redacted] April 14, GOOG-PLAY-006829073.R-172.R, at 168.R. *See also* Google, "Project Basecamp – Optionality," April 14, GOOG-PLAY-006829073.R-172.R, at 165.R [redacted]).

[1019] GDPR.EU, "Complete guide to GDPR compliance," available at https://gdpr.eu/.

[1020] Janßen, Rebecca, Reinhold Kesler, Michael E. Kummer, and Joel Waldfogel, "GDPR and the Lost Generation of Innovative Apps," *NBER Working Paper Series*, 2022 (hereafter "Janßen et al (2022)"), pp. 1 and 22.

[1021] Janßen et al (2022), p. 22.

[1022] Janßen et al (2022), pp. 2, 30.

mitigates concerns that only low-quality apps would enter after the reduction of commissions. This leads to substantial welfare gains as a result of enhanced entry of some high-quality apps.

493. Thus, as I explain above, in a world absent Google's anticompetitive conduct, it is my opinion that there would be increased supply (*i.e.,* more high-quality apps and in-app content available from developers), leading to lower equilibrium prices and higher equilibrium output, as well as increased innovation from developers.

VIII. Google's Anticompetitive Conduct Caused Harm to Competition in the Android In-App Billing Services Market

494. Having concluded that Google monopolized Android App Distribution, foreclosing rival app stores and causing harm to competition, I now develop evidence and analyses to evaluate the allegation that Google has tied its Android In-App Billing Services to Android App Distribution. To distribute apps through the Google Play Store, Google requires app developers to enter its standardized Developer Distribution Agreement ("DDA"), which states that developers must exclusively use Google Play Billing, Google's in-app billing services provider, to process all in-app purchases of digital content for apps distributed through Google Play, though it does not require, or actually allow, the use of Google Play Billing to process purchases of tangible goods and services consumed outside the digital environment.[1023] I find Google has tied use of Google Play Billing to distribution through the Google Play Store.

495. I conclude that Google's anticompetitive restrictions with regard to Android App Distribution has allowed it to charge supracompetitive commission on the In-App Billing Market. Moreover, the conduct has led to reduced consumer choice (apps), output, and innovation. In addition, I conclude that (i) an upper bound on competitive but-for commission is most likely to be 15% which is consistent with most of the commission discount programs that Google has implemented; (ii) the competitive but-for Play Points would have been launched earlier and, under a

[1023] Google, "Google Play Developer Distribution Agreement," November 17, 2020, GOOG-PLAY-000053875-878. *See* also, Play Console Help, "Payments," available at https://support.google.com/googleplay/android-developer/answer/9858738.

conservative assumption, the price discount through Play Points in the but-for world would be the same as in the actual world.

A. Google's Anticompetitive Conduct in Android In-App Billing Services Market Reduced Competition

1. Economics of Tying

496. In economics, tying refers to a situation in which a firm conditions the sale of one product (tying product) on the sale of another product (tied product). That is, a seller of tying product refuses to sell the tying product to consumers unless consumers also buy the tied product.[1024] If a firm has monopoly or market power in the tying product market, then, by tying the products, it can extend its market power to the tied product market, thereby foreclosing sales and monopolizing the tied product market.[1025] As a consequence, in general, the consumer and total welfare decrease, rivals are disincentivized to enter the tied product market, and innovation is harmed.[1026]

497. Economists have identified various environments and mechanisms under which tying can harm competition and result in a consumer welfare loss. For example, tying can serve as a mechanism to price discriminate among buyers of a tying product when the tying and the tied products are complements and tied product is used in varying amount with the tying product.[1027] The benefits of tying arising from the enhanced ability to price discriminate have also been shown

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[1024] Carlton, Dennis W. and Michael Waldman, "The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries," *The RAND Journal of Economics*, Vol. 33, No. 2, 2002, pp. 194-220 (hereafter "Carlton and Waldman (2002)").

[1025] Whinston, Michael D., "Tying, Foreclosure and Exclusion," *The American Economic Review*, Vol. 80, No. 4, 1990, pp. 837-859 (hereafter "Whinston (1990)").

[1026] Elhauge, Einer, "Tying, Bundled Discounts, and the Death of the Single Monopoly Profit Theory," *Harvard Law Review*, Vol. 123, No. 2, 2009, pp. 397-481 (hereafter "Elhauge (2009)"), at pp. 397-401; Choi, Jay Pil and Christodoulos Stefanadis, "Tying, Investment, and the Dynamic Leverage Theory," *The RAND Journal of Economics*, Vol. 32, No. 1, 2001, pp. 52-71 (hereafter "Choi and Stefanadis (2001)"). In addition to foreclosing sales and monopolizing the tied product market, tying can have anticompetitive effects on the tying product market. Tying can strengthen firm's monopoly power on the tying product market by deterring future entry into that market. *See* Carlton and Waldman (2002), pp. 194, 198-205.

[1027] Elhauge (2009), pp. 404-405.

in an environment in which there is no strong positive demand correlation between the tied and tying product.[1028]

498. Additionally, in economic models that relax the assumptions of constant returns to scale and perfect competition in the tied good market, it has been shown that tying is frequently a profitable strategy for a monopolist - even for independent products (not complements), a tying strategy can be profitable for a monopolist, foreclosing sales in the tied good market.[1029] Further, a bundling strategy can also be profitable, mitigating impact of competition:

> A company with a monopoly in product *A* and a duopoly in product *B* makes higher profits by selling an *A B* bundle than by selling *A* and *B* independently. Leveraging market power from *A* into *B* and accepting some one-product competition against the bundle is better than using the monopoly power in good A all by itself. Since bundling mitigates the impact of competition on the incumbent, an entrant can expect the bundling strategy to persist, even without any commitment.[1030]

499. Finally, resonating with some of the key lessons from economic theory, the Federal Trade Commission has explained the anticompetitive nature of tying as follows:

> a monopolist may use forced buying, or 'tie-in' sales, to gain sales in other markets where it is not dominant and to make it more difficult for rivals in those markets to obtain sales. This may limit consumer choice for buyers wanting to purchase one ('tying') product by forcing them to also buy a second ('tied') product as well. Typically, the 'tied' product may be a less desirable one that the buyer might not purchase unless required to do so, or may prefer to get from a different seller. If the seller offering the tied products has sufficient market power in the 'tying' product, these arrangements can violate the antitrust laws.[1031]

2. Google Has Tied Android App Distribution Through Google Play to Google Play Billing In-App Billing Services

500. In the current case, the tying product/service is the distribution of apps on Android smart mobile devices through Google Play, and the tied product/service is Google Play Billing

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[1028] Elhauge (2009), pp. 405-407.

[1029] Whinston (1990), pp. 838-840.

[1030] Nalebuff, Barry, "Bundling as an Entry Barrier," *The Quarterly Journal of Economics*, Vol. 119, No. 1, 2004, pp. 159-187, at p. 159.

[1031] Federal Trade Commission, "Tying the Sale of Two Products," available at https://www.ftc.gov/advice-guidance/competition-guidance/guide-antitrust-laws/single-firm-conduct/tying-sale-two-products.

services. I have been instructed by counsel to analyze whether the distribution of apps on Android smart mobile devices through Google Play and Google Play Billing services are separate and distinct products/services; whether Google has monopoly or market power in the distribution of apps on Android smart mobile devices through Google Play; and whether there is "coercion," meaning that the firm (Google) conditions the sale of the distribution of apps on Android smart mobile devices through the Google Play Store on the sale of Google Play Billing services and that the tying arrangement affects a not insubstantial volume of commerce in the market for Android In-App Billing Services.

501. I have previously demonstrated the first two criteria. In Sections V.C and V.D, I established that the Google Play Billing Services is a product distinct from the distribution of apps on Android smart mobile devices through Google Play, and I have defined the two markets, respectively. Further, I have shown and show further below that separate firms sell these products. In particular, developers could obtain payment processing and other in-app services from other firms besides Google but for contractual restraints imposed by Google. Further, I provide evidence that developers would like to do so. That is, developers do not perceive a technological benefit from tying the two products such that we should regard the tied products as a single new product. In Section VI.A, I have further shown that Google has a monopoly power in the market in which the tying product is sold.

502. Having established that the tied product (In-App Billing Services) is a distinct product and Google has a monopoly power in the tying product (Android App Distribution), I next demonstrate that Google has tied Android App Distribution through Google Play to the Google Play Billing In-App Billing Services and coerced app developers into the tying arrangement, which affects "a 'not insubstantial volume of commerce'" in the Android In-App Billing Services Market.

503. [redacted]

[redacted][1032] Sameer Samat, Vice President Product Management at Google, effectively testified that Google required this tie, stating [redacted]"[1033]

504. Further, the DDA also expressly prohibits developers from steering users to payment methods other than Google Play Billing, noting:[1034]

> Other than the conditions described in Section 3 and Section 8, apps may not lead users to a payment method other than Google Play's billing system. This prohibition includes, but is not limited to, leading users to other payment methods via:
> - An app's listing in Google Play;
> - In-app promotions related to purchasable content;
> - In-app webviews, buttons, links, messaging, advertisements or other calls to action; and
> - In-app user interface flows, including account creation or sign-up flows, that lead users from an app to a payment method other than Google Play's billing system as part of those flows.

[redacted]. Thus, users in the midst of

[1032] Google, "Google Play Developer Distribution Agreement," November 17, 2020, GOOG-PLAY-000053875-878; Google Play Console Help, Payments, available at https://support.google.com/googleplay/android-developer/answer/9858738. Note that Google's Vice President Product Management, Sameer Samat, posted a blog in September 2020 noting that "We've always required developers who distribute their apps on Play to use Google Play's billing system if they offer in-app purchases of digital goods, and pay a service fee from a percentage of the purchase." *See* Samat, Sameer, "Listening to Developer Feedback to Improve Google Play," *Android Developers Blog*, September 28, 2020, available at https://android-developers.googleblog.com/2020/09/listening-to-developer-feedback-to.html. Also, note that previous versions of the agreement, in addition, had an exception for "digital content consisting of **music, movies, TV shows, books, newspapers or magazines** that can currently be **used outside of the app** itself (*e.g.,* buying songs that can be played on other music players)." *See also* Google, "Google Play Developer Program Policies," March 9, 2012, GOOG-PLAY-006347283-285.

[1033] Samat (Google) Deposition, pp. 469-471; see also, Samat (Google) Deposition, pp. 483-485.

[1034] Google Play Console Help, *available at* https://support.google.com/googleplay/android-developer/answer/9858738?hl=en.

[1035] Samat (Google) Deposition, p. 484.

engaging with an app and prepared to make an in-app purchase could not be informed to make the purchase through an alternative means.

505. Sections 3 and 8 of the DDA summarize exceptions to the above rules involving purchases by users in South Korea and purchases of physical goods and services consumed outside the Play-distributed app.[1036] Section 8 states that developers may offer alternative in-app billing systems to users in South Korea.[1037] Importantly, Google was forced to institute the exception related to South Korea following the August 2021 policy change in South Korea, which prevented "app store operators from requiring developers to use their in-app purchase systems."[1038] Section 3 provides exceptions for non-digital goods and other services, noting Google Play Billing "must not be used" for such services.[1039]

[1036] Google, "Google Play Developer Distribution Agreement," November 17, 2020, GOOG-PLAY-000053875-878; Play Console Help, "Payments," available at https://support.google.com/googleplay/android-developer/answer/9858738. *See also*, Google, "Google Play Developer Program Policies," March 9, 2012, GOOG-PLAY-006347283-285, at 284.

[1037] Section 8 states that "developers of Play-distributed apps on mobile phones and tablets requiring or accepting payment from users in South Korea for access to in-app purchases may offer users an in app billing system in addition to Google Play's billing system…" (*See* Google, "Google Play Developer Distribution Agreement," November 17, 2020, GOOG-PLAY-000053875-878; Play Console Help, "Payments," available at https://support.google.com/googleplay/android-developer/answer/9858738.).

[1038] Fathi, Sami, "Apple's Proposal to Allow Third-Party Payment Methods in App Store 'Lacks Detail,' Says South Korean Regulatory Commission," *MacRumors*, February 3, 2022, available at https://www.macrumors.com/2022/02/03/app-store-plan-lacks-detail-south-kore/#:~:text=In%20August%2C%20South%20Korea%20passed,payment%20methods%20within%20their%20apps; Google, "Google Play Developer Distribution Agreement," November 17, 2020, GOOG-PLAY-000053875-878.

[1039] "Google Play's billing system must not be used" for purchase or rental of physical goods, purchase of physical services, remittance in respect of a credit card bill or utility bill, payments for content or services facilitating online gambling, peer-to-peer payments, online auctions, and tax exempt donations, payments for any product category deemed unacceptable under Google's Payments Center Content Policies. (*See* Play Console Help, "Payments," available at https://support.google.com/googleplay/android-developer/answer/9858738; Google, "Google Play Developer Distribution Agreement," November 17, 2020, GOOG-PLAY-000053875-878). *See also*, "Google Play Developer Program Policies," March 9, 2012, GOOG-PLAY-006347283-285, at 284.

3. *Google Actively Enforces its Tie by Coercing App Developers into the Tying Arrangement*

506. As early as the planning stages for its Android Market for In-App Billing service ("IAB"), which launched in March 2011[1040] and was the predecessor to Google Play Billing, Google was already intent on enforcing a tying arrangement to ensure that developers used their billing service for in-app payments. At the launch of its In-App Billing service, Google stated "[t]he In-app Billing service manages billing transactions between apps and users, providing a consistent purchasing experience with familiar forms of payment across all apps. At the same time, it gives you full control over how your digital goods are purchased and tracked. You can let Android Market manage and track the purchases for you or you can integrate with your own back-end service to verify and track purchases in the way that's best for your app."[1041] [redacted]

[redacted]

[1040] Chu, Eric, "In-App Billing on Android Market: Ready for Testing," *Android Developers Blog*, March 24, 2011, available at https://android-developers.googleblog.com/2011/03/in-app-billing-on-android-market-ready html ("Back in January we announced our plan to introduce Android Market In-app Billing this quarter. We're pleased to let you know that we will be launching In-app Billing next week.").

[1041] Chu, Eric, "New Merchandising and Billing Features on Android Market," *Android Developers Blog*, February 2, 2011, available at https://android-developers.googleblog.com/2011/02/new-merchandising-and-billing-features html.

[1042] Email from Dirk Dougherty to Anita Mhaskar, [redacted], March 10, 2011, GOOG-PLAY-004320094.

[1043] Email from Dirk Dougherty to Anita Mhaskar, [redacted], March 10, 2011, GOOG-PLAY-004320094.

507. Since then, as discussed in Section V.D.2 above, a number of developers have not complied with Google's Google Play Billing policy and have not used Google Play Billing. Google actively monitored which developers have not been complying with its Google Play Billing policies, and, in instances in which app developers have not been fully compliant (*i.e.,* they adopted alternative payment methods for digital in-app purchases), Google has informed such developers to comply with its rules and transition to Google Play Billing for digital in-app purchases.

508. In September 2020, Google clarified its Payments Policy incorporated into the DDA "to be more explicit that all developers selling digital goods and services in their apps are required to use Google Play's billing system."[1044] Google extended the date of compliance with the revised policy until June 1, 2022.[1045] [redacted][1046] [redacted]

[1044] Google, "Understanding Google Play's Payments policy," available at https://support.google.com/googleplay/android-developer/answer/10281818?hl=en. "Developers in India have until October 31, 2022 to comply due to unique circumstances with the payments landscape in the country."

[1045] Google, "Understanding Google Play's Payments policy," available at https://support.google.com/googleplay/android-developer/answer/10281818?hl=en. "Developers in India have until October 31, 2022 to comply due to unique circumstances with the payments landscape in the country."

[1046] *See, e.g.,* [redacted]

[redacted][1047] In response, some developers, such as Amazon,[1048] [redacted][1049] and Tidal,[1050] decided to make their Android apps "consumption-only," meaning that digital content may be purchased outside the app (such as on the web) to be used in the app. The result is that consumers cannot buy in-app what they could before, like Kindle books or movie streaming. [redacted][1051]

509. Moreover, Google has actively enforced these rules by punishing developers who fail to abide by them.[1052] [redacted][1053] In

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[1047] [redacted]

[1048] Laura Hautala, "Here's Why Amazon Won't Let You Buy Books on Kindle App for Android Anymore," CNET (June 2, 2022), *available at* https://www.cnet.com/tech/services-and-software/heres-why-amazon-wont-let-you-buy-books-on-kindle-app-for-android-anymore/ ("Amazon let customers know on Tuesday they can no longer rent or buy books or pay for Kindle Unlimited subscriptions using the Kindle app. In an email, the company explained people will have to pay for the digital content on a web browser and then access the books through their app's digital library. The change was necessary 'to remain in compliance with updated Google Play Store policies,' Amazon said in the email.").

[1049] [redacted]

[1050] Tidal, "Google Play Store," https://support.tidal.com/hc/en-us/articles/4472166442769-Google-Play-Store, *accessed Oct. 3, 2022* ("Q: Why can't I sign up for HiFi or HiFi Plus in the Android app? A: While you can sign up for TIDAL Free in the app, we have made some changes to the TIDAL HiFi and HiFi Plus sign up process in order to comply with new rules from Google for apps on the Google Play Store. At this time, it is unfortunately not possible to sign up for HiFi or HiFi Plus in the Android app. We are sorry for the inconvenience.").

[1051] [redacted]

[1052] Play Console Help, "Understanding Google Play's Payments policy," available at https://support.google.com/googleplay/android-developer/answer/10281818?hl=en ("Google Play's billing system is required for developers offering in-app purchases of digital goods and services distributed on Google Play … Starting June 1, 2022, any app that is still not compliant will be removed from Google Play.").

[1053] [redacted]

2020, several apps developed by Cracku, a developer providing online coaching and test preparation material for MBA Exams, Banking Exams, SSC, and Railways exams, were removed from Google Play due to the Google Play Store payments policy violation. [redacted][1054] Yet, Google does not apply the same standards to first party apps. For example, even though Google found Epic to be in violation of the DDA for using its own payment system in August of 2020, some Google first party apps were not in compliance with Google Play's billing policy. [redacted][1055]

4. *Developers May Prefer Alternatives to Google Play Billing for Various Reasons*

510. Developers' attempts to bypass Google's payment policies to choose alternative in-app billing services methods have revealed their preference for alternatives to Google Play Billing. [redacted][redacted] [redacted][1057] In addition, [redacted], including:[1058]

- [redacted]

[1054] Cracku, available at https://cracku.in/; Google, "App Name: SB I, IBPS PO, SSC, CAT Exam Preparation 2020," June 18, 2020, GOOG-PLAY-004696864-870, pp. 865 and 869.

[1055] Chu (Meta Platforms (formerly Google)) Deposition 212:18-213:2.

[1056] *See, e.g.*, Google, "Play Payments Policy," October 31, 2019, GOOG-PLAY-001088669.R-687.R, p. 5; Google, "Update on Play," GOOG-PLAY-000604882-902, pp. 1-2 [redacted]; Emails between Google personnel, [redacted] March 11-24, 2017, GOOG-PLAY-000257629-633, pp. 2-3; Google, "Play Billing Policy," August, 2019, GOOG-PLAY-003334312-347, p. 3 [redacted]

[1057] *See, e.g.*, Google, "Play Payments Policy," October 31, 2019, GOOG-PLAY-001088669.R-687.R, at 673.R [redacted]

[1058] Google, "Play Billing Policy," August, 2019, GOOG-PLAY-003334312-347, p. 5. *See also* Google, "Play update for Alphabet Board," Q2, 2020, GOOG-PLAY-000559379.R-384.R, p. 4 [redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted]

511. [redacted][1060]

512. [redacted][1061]

513. [redacted][1062] [redacted]

[1059] Feng (Google) Deposition, p. 315 [redacted]

[1060] Feng (Google) Deposition, pp. 180-181. [redacted] *See*, Google, "Defendants' Responses and Objections to Consumer Plaintiffs' First Set of Interrogatories" *State of Utah et al. v. Google LLC et al.* United States District Court for the Northern District of California San Francisco Division, Case No. 3:21-cv-05227-JD, October 11, 2021, pp. 26-27.

[1061] Google, [redacted] December, 2020, GOOG-PLAY-006997722.C-751.C, p. 3. *See also*, Email from Rishi Chandra, Google, to Google personnel, March 21, 2017, GOOG-PLAY-000257629-633, p.2 [redacted]

[1062] Emails between Google personnel, [redacted] October 22, 2014, GOOG-PLAY-004470512-516, pp. 1-2; Google, [redacted] February 2, 2015, GOOG-PLAY-000308691-692, p.1.

[redacted][1063] [redacted][1064]

514. [redacted][1067]

515. [redacted][1068] [redacted][1069]

[1063] Google, [redacted] December, 2020, GOOG-PLAY-006997722.C-751.C, at 723.C.

[1064] Google, [redacted] December, 2020, GOOG-PLAY-006997722.C-751.C, at 734.C.

[1065] [redacted]

[1068] Google, [redacted]," August, 2017, GOOG-PLAY-000262353.R-389.R, p. 5.

[1069] Google, [redacted] August, 2017, GOOG-PLAY-000262353.R-389.R, pp. 7-8.

[redacted][1070]

516. [redacted][1071] [redacted][1072] [redacted][1073]

Specifically:

517. [redacted][1074] [redacted][1075] [redacted]

[1070] Google, [redacted] January 2021, GOOG-PLAY-006817773.R-890.R, p. 81. [redacted] *see* Feng (Google) Deposition, pp. 389-390 ([redacted].

[1071] Emails between Google personnel, [redacted] December 16, 2016-June 27, 2017, GOOG-PLAY-000840773-782, p. 7.

[1072] Emails between Google personnel, [redacted] December 16, 2016-June 27, 2017, GOOG-PLAY-000840773-782, p. 7. *See also* Samat (Google) Deposition, pp. 508-529.

[1073] Emails between Google personnel, [redacted] December 16, 2016-June 27, 2017, GOOG-PLAY-000840773-782, p. 2.

[1074] GOOG-PLAY-002438751, p. 1.

[1075] [redacted]

[redacted][1076] [redacted][1077]

518. [redacted][1078] In May 2022, after Match Group filed a complaint against Google, "alleging the company 'illegally monopolized the market for distributing apps' by requiring app developers to use Google's billing system and then taking up to a 30% cut on any in-app purchases." Google and Match Group reached an agreement that allows "its apps to remain on the Google Play Store while offering alternate payment systems."[1079]

519. In spring 2022, Epic acquired Bandcamp, an online music platform.[1080] Epic wanted to use an alternative payment system for Bandcamp because "Google's stricter in-app purchase requirements (which will demand that Bandcamp use Google's billing system from June 1st) and delayed payments (from a maximum 48 hours to as long as 45 days) would cause 'irreparable harm'

[redacted]

[1077] Emails between Google personnel, [redacted] December 16, 2016-June 27, 2017, GOOG-PLAY-000840773-782, p. 7.

[1078] Google, [redacted] August, 2019, GOOG-PLAY-002438751-754, p. 3.

[1079] Competition Policy International (CPI), "Google Allows Match to Use Alternate Payments as the[y] Head to Trial," May 22, 2022, available at https://www.competitionpolicyinternational.com/google-allows-match-to-use-alternate-payments-as-the-head-to-trial/ (hereafter "CPI (2022)"). *See also* "Stipulation and [Proposed] Order on Match's Motion for Temporary Restraining Order," *Match Group, LLC; Humor Rainbow, Inc; Plentyoffish Media ULC; and People Media, Inc. v. Google LLC; Google Ireland Limited; Google Commerce Limited; Google Asia Pacific PTE. Limited; and Google Payment Corp.,* United States District Court for the Northern District of California San Francisco Division, Case No. 3:22-cv-02746-JD, May 19, 2022.

[1080] Sisario, Ben, "Gaming Giant Behind Fortnite Buys Bandcamp, an Indie Music Haven," *The New York Times*, March 8, 2022, available at https://www nytimes.com/2022/03/02/arts/music/epic-games-bandcamp.html; Fingas, J., "Epic Games is Acquiring Music Marketplace Bandcamp," *engadget*, March 2, 2022, available at https://www.engadget.com/epic-games-acquires-bandcamp-173446180.html.

to both Epic and musicians."[1081] However, Epic games was worried that Google might pull the app from its platform if it used an alternative payment system.[1082] Consequently, it filed for a preliminary injunction to enjoin Google from "removing … or otherwise making unavailable the app Bandcamp … on the basis that Bandcamp offers in-app payments through means other than Google Play Billing."[1083] On May 20, 2022, Google and Epic reached an agreement that allows Bandcamp to remain on the Google Play Store while offering alternate payment systems.[1084]

520. Google coerces developers to use Google Play Billing even though it recognizes that Google Play Billing may not be readily tailored to an app. For example, Google's own app YouTube[1085] did not integrate with Google Play Billing because it lacked certain features.[1086] [redacted][1087]

[1081] Fingas, J., "Epic Asks Court to Stop Google's Removal of Bandcamp from the Play Store (updated)," *engadget*, April 29, 2022, available at https://www.engadget.com/epic-preliminary-injunction-google-bandcamp-app-151821052.html.

[1082] Fingas, J., "Epic Asks Court to Stop Google's Removal of Bandcamp from the Play Store (updated)," *engadget*, April 29, 2022, available at https://www.engadget.com/epic-preliminary-injunction-google-bandcamp-app-151821052.html.

[1083] "Joint Stipulation and [Proposed] Order Regarding Epic Games, Inc.'s Request for Preliminary Relief," *Epic Games Inc. v. Google LLC et al.*, the United States District Court for the Northern District of California San Francisco Division, Case No. 3:20-cv-05671-JD, May 20, 2022 (hereafter "Epic v. Google Re. Bandcamp").

[1084] Epic v. Google Re. Bandcamp.

[1085] YouTube offers paid services including YouTube Premium, which allows users to view videos on the platform ad-free in addition to other features, and YouTube TV, which enables users to stream live content from cable channels and networks using an internet connection. See Moore, Ben, "YouTube Premium vs. YouTube TV: What's the Difference?" *PCMag*, August 5, 2021, available at https://www.pcmag.com/how-to/youtube-premium-vs-youtube-tv-whats-the-difference.

[1086] Google, "Play Payments Policy," October 31, 2019, GOOG-PLAY-001088669.R-687.R, at 673.R.

[1087] Chu (Meta Platforms (formerly Google)) Deposition, pp. 220, 223, and 224; Messages between Eric Chu and Eunice Kim, Google personnel, June, 6, 2020, GOOG-PLAY-003600814-816.

521. [redacted][1088] [redacted] [redacted][1090] [redacted][1091] [redacted][1092]

[1088] [redacted].

[1089] OpenIAB, Github (last accessed Sept. 24, 2022), https://github.com/onepf/OpenIAB; [redacted]

[1090] OpenIAB, Github (last accessed Sept. 24, 2022), https://github.com/onepf/OpenIAB; [redacted]

[1091] [redacted]

[1092] [redacted]

5. Google's Anticompetitive Tying Arrangement Affects Nearly All Developers and Foreclosed Rival In-App Billing Services Providers

522. Google's rules have forced nearly all developers to use Google Play Billing, with few exceptions, therefore foreclosing a substantial part of the Android In-App Billing Services Market for rival in-app billing service providers. For example, in September 2020, Sameer Samat, Vice President Product Management at Google, posted on Google's blog:[1093]

> Less than 3% of developers with apps on Play sold digital goods over the last 12 months, and of this 3%, the vast majority (nearly 97%) already use Google Play's billing. But for those who already have an app on Google Play that requires technical work to integrate our billing system, we do not want to unduly disrupt their roadmaps and are giving a year (until September 30, 2021) to complete any needed updates. And of course we will require Google's apps that do not already use Google Play's billing system to make the necessary updates as well.

523. [redacted][1094]

524. Given Google Play Store's dominance in the Android App Distribution Market and Google Play Billing's very high usage among developers who distribute apps on the Google Play Store, Google has a substantial share of the Android In-App Billing Services Market. Indeed, as estimated in Section VI.C, in 2019 Google Play Billing's market share was approximately 87% in terms of revenues. Thus, I conclude that Google's tying arrangement has affected a not insubstantial volume of commerce in the tied product market.

[1093] Samat, Sameer, "Listening to Developer Feedback to Improve Google Play," *Android Developers Blog*, September 28, 2020, available at https://android-developers.googleblog.com/2020/09/listening-to-developer-feedback-to.html.

[1094] Google, "Checkin with Hiroshi," September 13, 2019, GOOG-PLAY-007346993-049, at 002.

6. Conclusion: Google Successfully Imposed an Anticompetitive Tie

525. Based on the evidence described above, I find that: (i) Google Play Billing is a product distinct from the Google Play Store; (ii) Google has imposed rules requiring developers to use Google Play's Billing for all subsequent in-app purchases of digital content in the apps that were downloaded through Google Play; (iii) these rules have been actively enforced by Google; (iv) developers have been coerced into using Google Play Billing for purchases of in-app digital content as a condition to distribute on Google Play Store; (v) developers have voiced concerns regarding Google Play Billing and, in some instances, have preferred alternative in-app billing services; and (vi) the rules have foreclosed a substantial part of the market for rival in-app billing service providers. Thus, this tying arrangement has affected a substantial part of the Android In-App Billing Services Market. I have also demonstrated that Google's tie has created substantial foreclosure to competing Android in-app billing service providers.

B. Google's Anticompetitive Conduct in the In-App Billing Services Market Has Allowed it to Impose Supracompetitive Commissions

526. Google's anticompetitive tying arrangements have allowed it to charge supracompetitive commissions. As I explained in Section VI, with a few exceptions, Google charges a 30% commission for paid apps and in-app digital content sold through the Google Play Store.[1095] In what follows, I show that the commission on the Android In-App Billing Services Market would have been lower under a competitive but-for world in which Google did not extend

[1095] Google, "Google Play Console Help, Service fees," available at https://support.google.com/googleplay/android-developer/answer/112622?hl=en&visit_id=637872098045257136-3276584470&rd=1. There are a few exceptions: (i) starting July 1, 2021, the service fee "for each developer will be 15% for the first $1M (USD) of earnings you make each year when you sell digital goods or services;" (ii) for automatically renewed subscriptions the service fee is 15%; (iii) "As of December 18, 2021, for developers who offer an alternative in-app billing system in addition to Google Play's billing system for transactions with users in South Korea… the service fee for such transactions using the Additional Billing System is equal to the service fee applicable for transactions via Google Play's billing system reduced by 4%." *See also* Google Play Console Help, Changes to Google Play's service fee in 2021, available at https://support.google.com/googleplay/android-developer/answer/10632485. Also, in March 2022, Spotify announced that "[u]sers who've downloaded Spotify from the Google Play Store will be presented with a choice to pay with either Spotify's payment system or with Google Play Billing." *See* Spotify, "Spotify and Google Announce User Choice Billing," March 23, 2022 available at https://newsroom.spotify.com/2022-03-23/spotify-and-google-announce-user-choice-billing/.

its market power from the tying to the tied product, hence not effectively foreclosing the Android In-App Billing Services Market. Moreover, the commission would likely have been lower as enhanced competition on the In-App Billing Services Markets would potentially lead to "laddering up," *i.e.*, enhanced distribution and discoverability for apps, as discussed in section VII.B, hence enhancing competition in the Android App Distribution Market as well.

1. Google Has Charged Commissions Substantially Above Its Marginal Costs and Has Offered Lower Commissions on Several Occasions

527. In section VII.B.1, I explained that Google has charged a supracompetitive commission that is substantially above marginal costs. In addition, I explained that Google was able and willing to substantially decrease commission in the face of some limited competitive pressures or other goals related to growth and success of its business.

528. [redacted][1098]

529. [redacted][1099] [redacted]

[1096] Google, [redacted] March 5, 2020, GOOG-PLAY-001291192.R-232.R (emphasis added).

[1097] GOOG-PLAY-001291192.R.

[1098] Rosenberg (Google) Deposition, p. 264 (emphasis added).

[1099] GOOG-PLAY-001291192.R, at 208.R and 210.R (emphasis added).

[redacted][1100] [redacted][1101]

[redacted]

[redacted]

[1100] GOOG-PLAY-001291192.R, at 208.R and 210.R.

[1101] "Defendants Google LLC, Google Ireland Limited, Google Commerce LTD., Google Asia Pacific PTE. LTD. and Google Payment Corp.'s Answers and Objections to Developer Plaintiffs' First Set of Interrogatories to Defendants," the United States District Court for the Northern District of California San Francisco Division, Google Play Store Developer Antitrust Litigation, Case No. 3:20-cv-05792-JD, July 6, 2021, at pp. 13-15.

[1102] Google, [redacted] November 2020, GOOG-PLAY-004684227.R-239.R, at 228.R and 237.R.

[1103] GOOG-PLAY-004684227.R, at 228.R and 237.R.

[1104] Google, [redacted] April 2021, GOOG-PLAY-006998204.R-211.R, at 206.R.

[1105] Google, [redacted] GOOG-PLAY-000233314-319.

[1106] Email from Mike Herring, Google, to Ruth Porat, CFO at Google, [redacted] April 8, 2019, GOOG-PLAY-000000807-815, at 808 [redacted]

[1107] GOOG-PLAY-006998204.R, at 206.R.

[redacted][1108]

532. [redacted]

[redacted][1112]

534. Thus, the evidence above indicates Google's ability and willingness to decrease commission substantially in the face of some limited competitive pressures or other goals related to

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[1108] GOOG-PLAY-001291192.R, at 202.R-206.R.

[1109] Google, [redacted] December 2020, GOOG-PLAY-006997722-751, at 723.

[1110] GOOG-PLAY-006997722, at 734.

[1111] Google, [redacted] March 2019, GOOG-PLAY-000542516.R-535.R, at 532.R.

[1112] Google, [redacted] September 13, 2019, GOOG-PLAY-007173383-451, at 435.

growth and success of its business (and in most cases, in the face of threat to its tying arrangement), indicating that its 30% commission for GPB is supracompetitive.

2. *Competitive But-For World Commission*

535. As the evidence above indicates, (i) Google's 30% commission is supracompetitive; and (ii) Google was able and willing to substantially decrease commissions in the face of competitive pressures or other goals related to growth and success of its business. Thus, it is my opinion that, in a competitive but-for world in which Google had not pursued an anticompetitive tying strategy and hence did not foreclose a substantial part of the Android In-App Billing Services Market to potential competing in-app billing service providers, there would be enhanced competitive pressure on Google. Many developers would become more price sensitive as they would have more alternatives from which to choose and switch if desired. Developers would have an increased ability to find a substitute to Google's own payment system and, according to the evidence above, this would discipline Google's price setting power and hence its commission.

536. The lower commissions that Google has offered to various developers over time, as described above, thus serve as upper bounds on what the commissions would look like in a competitive but-for world because in the competitive but-for world competitive pressure on Google would be what Google has faced so far in the actual world plus additional pressure due to enhanced competition. In addition, the commissions would likely be lowered on both Android App Distribution and In-App Billing Services Markets as enhanced competition on the In-App Billing Services Markets would potentially lead to "laddering up" as discussed in section VII.B, hence enhancing competition and lowering commissions on the Android App Distribution Market as well.

537. Given the above evidence, I take 15% as an upper bound on the commission in a but-for world in which Google does not pursue an anticompetitive tying strategy: (i) [redacted]

[redacted][1113] (ii) [redacted][1114] (iii) [redacted][1115] and the maximum service fee offered by those programs is 15%. Moreover, I am not aware of any evidence that Google's margins on the Google Play Store under these programs were negative.

3. *Competitive But-For World Commissions Are In-Line with Commissions on Other App Stores*

538. In section VII.B, I explained that comparing Google's commission in the Google Play Store to commissions offered by PC app stores is informative about whether Google's commissions for Android App Distribution and In-App Billing Services through the Google Play Store are supracompetitive. In addition, I showed that commissions of some major PC app stores are bounded above by Google's commission of 30% and the lower commissions are in-line with the commissions that Google has offered to various price sensitive developers over time.

539. In section VII.B I also showed that commissions offered by alternative Android app stores are also bounded above by 30% and are generally below 30%, which provides yet another indication that mobile app stores are able and willing to decrease their commissions below 30%.

[1113] GOOG-PLAY-001291192, at 208.R and 210.R.

[1114] GOOG-PLAY-006997722, at 723; GOOG-PLAY-001291192, at 208.R and 210.R.

[1115] "Defendants Google LLC, Google Ireland Limited, Google Commerce LTD., Google Asia Pacific PTE. LTD. and Google Payment Corp.'s Answers and Objections to Developer Plaintiffs' First Set of Interrogatories to Defendants," the United States District Court for the Northern District of California San Francisco Division, Google Play Store Developer Antitrust Litigation, Case No. 3:20-cv-05792-JD, July 6, 2021, at pp. 12-14.

4. Direct Discounts to Consumers

540. In section VII.B, I explained that providing direct discounts to consumers is an effective way to retain or acquire consumers when faced with competitive pressures. Google and developers of other app stores have acknowledged this and have offered discounts to consumers in the face of competitive threats.

C. Google's Anticompetitive Conduct in the Android In-App Billing Services Market Has Lowered Output and Harmed Innovation

541. In addition to allowing Google to charge supracompetitive commissions, it is my opinion that Google's tying has also resulted in reduced output and innovation. In a competitive but-for world, in which the Android In-App Billing Services Market were not subject to tying arrangements, there would be higher output and greater innovation. The output would be higher because more developers would be willing to enter the market as their expected profits from doing so would be higher given the lower commissions set by Google, and billing services options available on the market. This would translate into increased supply (*i.e.*, more apps and in-app content available from developers).[1116] Consequently, there would be a lower equilibrium price of apps and in-app content and higher equilibrium output.[1117]

542. In section VII.C, I estimate the increase in output and varieties (number of apps) in a competitive but-for world using my model. Those output and variety increases would be similar if Google did not impose anticompetitive tying arrangements. In my model, developers would create new apps if it became profitable to do so. In a competitive but-for world, Google's commission would be lower and direct discounts to consumers would be higher hence making it more profitable for developers to create and post new apps on Google Play. In section VII.C, I also show that lower commissions would free up financial resources for developers to invest in capacity and innovation.

[1116] Mankiw, N. Gregory, *Principles of Microeconomics*, Fifth Edition, South-Western CENGAGE Learning, 2008 (hereafter "Mankiw (2008)"), pp. 304-305.

[1117] *See* Appendix F where I develop a model underlying my damages calculations. The model provides a mechanism through which lower commission translates into increased supply of apps and in-app content, resulting into lower equilibrium price and higher output.

543. Evidence in the record supports my opinion that absent Google's anticompetitive conduct, there would be increased innovation and more features of payment solutions available to developers on Google Play.

544. Payment services providers other than Google Play Billing have various features that are unavailable to app developers required to use Google Play Billing. For example, "Google Play's billing system is a service that enables you to sell digital products and content in your Android app."[1118] In contrast, other payment service providers are available across multiple platforms - Amazon Pay, Braintree, PayPal, Square, and Stripe are a few examples of providers that are also available on iOS.[1119] In addition, Google Play Billing does not process payments for physical goods.[1120] In contrast, Amazon Pay, Braintree, PayPal, Square, and Stripe do.[1121] [redacted][1122] [redacted][1123] [redacted]

[1118] Google, "Google Play's billing system overview," June 29, 2022, available at https://developer.android.com/google/play/billing.

[1119] Amazon Pay, "Support," available at https://www.amazonpay.in/help/202030010; Braintree, "Accept and process payments online," available at https://www.braintreepayments.com/products/braintree-direct; PayPal, "Add payment checkout to an app with PayPal Mobile Checkout SDK," available at https://developer.paypal.com/limited-release/paypal-mobile-checkout/; Square, "Payments," available at https://developer.squareup.com/docs/payments; Stripe, "Accept a payment using Stripe Elements and the Charges API," available at https://stripe.com/docs/payments/accept-a-payment-charges.

[1120] Google, "Google Play Developer Distribution Agreement," available at https://play.google.com/about/developer-distribution-agreement.html. *See also* Play Console Help, "Payments," available at https://support.google.com/googleplay/android-developer/answer/9858738.

[1121] Stripe, "A complete payment platform, engineered for growth," available at https://stripe.com/en-gb-be/payments; PayPal, "Seller Protection for Merchants," available at https://www.paypal.com/us/webapps/mpp/security/seller-protection; Amazon Pay, "For Merchants - Make Amazon's customers your customers," available at https://www.amazonpay.in/merchant; Braintree, "Accept and process payments online," available at https://www.braintreepayments.com/products/braintree-direct; Square, "Add a Physical Item to Square Online," available at https://squareup.com/help/us/en/article/7046-add-a-physical-product.

[1122] Google, "Play Billing Policy," August 2019, GOOG-PLAY-003334312-347, at 316.

[1123] GOOG-PLAY-003334312, at 316.

[redacted]

545. Google Play Billing is also not tailored to developers' specific needs and requirements and can be too generic. [redacted][1124] [redacted][1125]

546. In Section VIII.A.4, I also discuss examples of various developers [redacted]

547. Finally, requiring app developers to use Google Play Billing would also harm app developers' incentives to invest in and innovate their own payment solutions. [redacted][1126]

> [redacted]

[1124] Chu (Meta Platforms (formerly Google)) Deposition, p. 282: [redacted].

[1125] Email from Eric Chu, Engineering Director at Google (former), to Prachi Gupta, Google, Will Aldrich, Google, and Eunice Kim, Google, [redacted] July 31, 2020, GOOG-PLAY-001741853-854; Chu (Meta Platforms (formerly Google)) Deposition, pp. 276-279.

[1126] Chu (Meta Platforms (formerly Google)) Deposition, pp. 219-223; PX 316, GOOG-PLAY-003600814, at 816; *see also* Google, [redacted] GOOG-PLAY-001088593-601, at 596 [redacted]

[redacted]

548. [redacted][1127] [redacted][1128]

549. [redacted].[1129] [redacted]"[1130] So, Google offered lower commission and a more advanced and flexible version of GPB when faced with a threat of Spotify going consumption-only. This serves as an evidence of Google improving the quality of its billing services as a result of threat of losing a customer.

550. In summary, the evidence suggests that there are billing service providers (or developers having capability to provide billing services) that have features and quality that Google Play Billing does not have. Moreover, those providers are better tailored to various developer needs

[1127] GOOG-PLAY-003600814, at 816.

[1128] Google, [redacted] GOOG-PLAY-000560166-172 [redacted] at 166.

[1129] GOOG-PLAY-006997722, at 734.

[1130] GOOG-PLAY-006997722, at 725.

as compared to Google Play Billing. However, since those providers are being foreclosed by Google's anticompetitive tie, developers are not enjoying all the benefits of additional features offered by those providers. Finally, Google's anticompetitive tie harms innovation in billing services as it disincentivizes investment and development in this sphere - further limiting the potential variety and quality of billing services to the developers.

IX. Google's Anticompetitive Conduct Has Harmed Consumers in the U.S.

551. Having established that Google's anticompetitive conduct harmed competition, I now present an economic model that can be used to quantify the extent to which Google's conduct harmed consumers. I explain my theoretical model, describe the components I use to estimate the model, and present a summary of the damages in the Plaintiff States and nationwide during the period from August 16, 2016 to May 31, 2022 (the date of the last transaction in the Google transaction data). I also extrapolate the results through June 5, 2023, the date on which trial in this case is set to begin. Damages by Plaintiff State/year are presented in Appendix I.

A. Model of Competition

552. I develop a model of monopolistic competition between apps, based on Church and Gandal (1993), in which developers supply apps and in-app content and compete on prices charged to consumers.[1131] Entry of apps determines the number of apps in an app store. The model is developed and explained in more detail in Appendix F.

553. The model has three stages and is in the tradition of models of monopolistic competition.[1132] Models of monopolistic competition feature a large number of firms that supply differentiated products to consumers. The firms have a degree of market power because their products are unique in certain aspect (they are differentiated), *i.e.,* consumers would not be willing

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[1131] Church, Jeffrey and Neil Gandal. "Complementary network externalities and technological adoption," *International Journal of Industrial Organization* 11, 1993, pp. 239-260 (hereafter "Church and Gandal (1993)").

[1132] *See e.g.* Dixit and Stiglitz (1977); Church and Gandal (1993); Nair, Harikesh, Pradeep Chintagunta, and Jean-Pierre Dube, "Empirical Analysis of Indirect Network Effects in the Market for Personal Digital Assistants," *Quantitative Marketing and Economics*, 2, 2004, pp. 23–58 (hereafter "Nair et al (2004)").

to fully substitute to other products in response to the price changes. The degree to which consumers would be willing to substitute to other products is one determinant of firms' market power. In the long run, firms enter or exit depending on the cost of entry. Firms keep entering up to the point when it is no longer profitable for additional firms to enter the market. This further drive down firms' market power and prices.

554. In my model, in the first stage, the app developers make a decision to create an app to post on the platform or not to do so (entry decision). If an app is posted then, in the second stage, the app developer sets the app price (pricing decision). In the third stage, the consumer decides how many transactions to make with app developers who have posted apps on the platform. The consumer takes app prices, the number of available apps on the market, and Google's direct discounts to consumers as given when making a choice of how much to transact at each app, *i.e.,* how to allocate her budget across various apps. This determines consumer's demand for apps. In the second stage, when an app developer makes her pricing decision, she takes demand and the commission rate as given and sets price to maximize profits. At the point of making the entry decision, the app developer compares its fixed cost of making the app to the expected profits from the second and third stages of the model. The app developer enters if the expected profits cover its fixed cost. As more apps decide to enter, the expected profits to each app falls (because competition drives prices down and because more entrants means each captures smaller market share).

555. The model can be used to quantify two separate effects of Google's conduct, as compared to the but-for competitive world, and the associated damages: (i) the direct effect of an inflated commission and later-introduced Play Points on prices (overcharge effect); and (ii) the consumer welfare lost through decreased app variety while holding the app and in-app content prices at the actual world level (variety effect). In addition, I calculate (iii) the combined welfare effect of an inflated commission and later-in-time Play Points accounting for both the overcharge and variety effects.

1. Direct Effect of Lower Commissions and Earlier Introduction of Play Points on Prices

556. The overcharge effect results from a lower commission and from the earlier introduction of Play Points given to consumers in the hypothetical world absent Google's

anticompetitive conduct. A lower commission charged by Google can affect the prices consumers pay for apps and in-app content through two mechanisms. The first results from a decreased commission causing marginal revenue to rise relative to marginal cost. In other words, app developers' margins increase as the commission decreases. As a result of the lower commission, a profit-maximizing developer would want to reduce price. I refer to this as a direct effect of a lower commission on prices. The second mechanism is the downward pressure on prices caused by new entry. All else being equal, a lower commission implies higher revenue per unit sold, and thus, higher expected profits for developers, which facilitates entry of more apps. Consequently, increased entry implies (i) a greater variety of apps and higher number of successful apps; and (ii) fiercer competition, which leads to lower prices. Conservatively, my overcharge damages calculation accounts only for the first of these two mechanisms, *i.e.*, the direct effect as a result of marginal revenue becoming higher than marginal cost if Google's commission were to decrease. Additionally, the earlier introduction of Play Points reduces the final prices that consumers pay, and hence, affects the overcharge to consumers directly. My overcharge calculation accounts for this effect.

557. I can solve the model to obtain a but-for price per transaction that consumers would pay after accounting for Google's but-for commission and price discount (Google's but-for price discount accounts for the but-for earlier introduction of Play Points); subtract that but-for price from the actual price after Google's actual price discount; and divide by the actual price after Google's actual price discount to get the percentage overcharge. Finally, I multiply the percentage overcharge by the net consumer spend (netting out Google and developer discounts) over the damages period (August 16, 2016 – June 5, 2023) to calculate damages due to this effect. The overcharge that I calculate as a result of the lower commission in the but-for world equals the difference in Google's commissions (in $) between the actual world and the but-for world. In other words, the pure

overcharge calculation predicts that in the but-for world developers would have passed on to consumers all the value of the reduction in commission in the form of lower app prices.[1133]

558. For an illustration, suppose that p_1 is the price in the actual world, p_2 is the price in the but-for world, τ_1 is the commission in the actual world, and τ_2 is the commission in the but-for world. Then the overcharge to consumers as a result of higher commission (in $) would equal to $\tau_2 p_2 - \tau_1 p_1$. That is, in my model, the price in the but-for world would fall to the point where $p_2 - p_1 = \tau_2 p_2 - \tau_1 p_1$ holds.[1134]

559. This result is independent from the app's marginal cost in my model, as long as the marginal cost is not zero. The reason why this is independent of marginal cost is that the optimal price set by an app is equal to markup times the app's marginal cost.[1135] Hence, the percentage change in optimal prices set by firms would be independent of the marginal cost as it scales the prices in the but-for and actual world by the same amount, in my model. As I demonstrate in Section IX.B below, in general, marginal cost is likely to be greater than zero.

2. *Welfare Effect through Increased Varieties (Apps)*

560. In addition to the direct effect on price, my model also considers a second effect through which Google's anticompetitive conduct harms consumers – the welfare lost in the form of less app variety. I first consider, as an illustration, a hypothetical scenario in which prices are sticky in the but-for world, (*i.e.*, prices remain at the same level as in the actual world ($p_2 = p_1$)). In this scenario, there are no overcharge damages, as, by assumption, prices do not change. Nonetheless, as

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[1133] I understand that other trial experts in this case may opine on the question of whether consumers may have felt less than 100% of the price effect due to market conditions. I have not been asked to opine on that question. However, the model can easily be adapted to show the price and variety effects on consumers given different assumptions about the market. To the extent that other experts in this case opine that consumers felt less than 100% of the price effect of Google's conduct, I reserve the right in rebuttal to testify about the effect of those different assumptions on my model's calculations.

[1134] *See* for example Anderson, Simon P., André de Palma, and Brent Kreider, "Tax Incidence in Differentiated Product Oligopoly," *Journal of Public Economics*, Vol. 81, 2001, pp. 173–192, at 172 ("[A]d valorem… taxes in an oligopolistic industry with differentiated products and price setting (Bertrand) firms… may be passed on to consumer by more than 100 percent…").

[1135] *See* Landes, William M. and Richard A. Posner, "Market Power in Antitrust Cases," *Harvard Law Review*, Vol. 94, No. 5, 1981, pp. 937-996 (hereafter "Landes and Posner (1981)"), at pp. 937-939.

I demonstrate below and describe in more detail in Appendix F, even in a world in which there is no direct effect on price, there is still harm to consumers in the form of lost app variety.

561. My model demonstrates that, but for Google's conduct, there would be a greater variety of apps on the market, which would increase consumers' utility. As I demonstrate below, the loss of this utility benefit due to Google's anticompetitive conduct can be quantified in dollar terms. Analyzing or quantifying the preferences for and benefits of variety to consumers is common in the economics literature.[1136]

562. While lower commissions decrease prices that consumers pay for downloads and in-app purchases, as explained above, I shut down this price effect by holding price constant in the model when quantifying the welfare effect through increased varieties; that is, I fix app and in-app prices at the actual levels and consider only the welfare effects of increased varieties (or the number of apps) due to the lower commissions and more Play Points in the competitive but-for world. Even if app prices did not change in the competitive but-for world, developers would still expect higher profits because lower commissions imply higher revenues per transaction and an earlier launch of Play Points implies increased demand from consumers (as explained below, earlier launch of Play Points translates into the higher direct discounts to consumers). These effects induce more entry because developers would, in the hypothetical world, expect higher profits that are more likely to cover developers' fixed costs or make developing a new app more profitable than their next best alternative option to developing an app, and hence, more apps would enter the market.[1137]

[1136] Dixit, Avinash K. and Joseph E. Stiglitz, "Monopolistic Competition and Optimum Product Diversity," *The American Economic Review*, Vol. 67, No. 3, 1977, pp. 297-308 (hereafter "Dixit and Stiglitz (1977)"); Petrin, Amil, "Quantifying the Benefits of New Products: The Case of the Minivan," *Journal of Political Economy*, Vol. 10, No. 4, August 2002 (hereafter "Petrin (2002)"); Brynjolfsson, Erik, Yu (Jeffrey) Hu, and Michael D. Smith, "Consumer Surplus in the Digital Economy: Estimating the Value of Increased Product Variety at Online Booksellers," *Management Science*, Vol. 49, No. 11, 2003, pp. 1580-1596 (hereafter "Brynjolfsson et al (2003)"); Nair et al (2004), pp. 25, 35, 43-45,

[1137] Because I do not allow prices to fall either because of the direct effects of lower commissions and higher Play Points, or because of the increased competition between apps as more apps enter, the variety effect that I measure is larger than it would be if prices adjusted. The reason is that if prices also adjusted downward, fewer firms would enter given the lower prices. When I calculate the change in total consumer welfare, I account for changes in prices and variety together.

563. In my model, consumers intrinsically value varieties (more apps), and as a result, their welfare improves in the competitive but-for world even if app prices do not decrease. The model allows me to calculate the amount of money that one would need to give to consumers in the actual world (under the actual prices and varieties) to generate the utility level that they would experience in the competitive but-for world. For example, if the utility level in the but-for world would be 5 and in the actual world it is calculated to be 3, I can quantify the dollar value that provides consumers the utility levels of 3 and 5. This method for converting a welfare change to a dollar equivalent is referred to as equivalent variation in the economics literature.[1138] I explain how I derive the equivalent variation in Appendix F. The value in dollars of the foregone benefits of additional apps is another source of damages to consumers.

3. *Total Welfare Effect of Lower Commissions or Earlier Launch of Play Points*

564. In fact, in a world absent Google's challenged conduct, consumers would have benefited from both effects described above. Thus, the total welfare effect includes both welfare effects due to the price decrease and welfare effects due to the increased varieties. Consumers benefit directly from lower prices, which enable them to buy more products and more of each product. On the other hand, the lower commission and earlier introduction of Play Points would increase developers' profits and induce more entry and competition. As a result, consumers also benefit from more varieties. To calculate the total damages, I convert the total welfare change to dollar equivalent as explained in Section IX.A.2 above, the details of which are described in Appendix I.

565. One thing to note is that, unlike the welfare effect through increased varieties described in Section IX.A.2 above, the total welfare effect allows for prices to change as a result of lower commission and higher Play Points as well as increased competition between apps as more

[1138] For a discussion about notions of equivalent and compensating variation, *see* Mas-Colell, Andreu, Michael D. Whinston, and Jerry R. Green, "*Microeconomic Theory*," Oxford University Press, June 1995 (hereafter "Mas-Colell et al (1995)"), pp. 80-91. *See* also Varian, Hal R., "*Intermediate Microeconomics: a Modern Approach*," Eighth Edition, New York, NY:W.W. Norton & Company, 2010 (hereafter "Varian (2010)"), pp. 258-262.

apps enter. Since the prices decrease, this puts downward pressure on developers' profits and induces less entry (and hence less variety) compared to the case where I assume that prices are sticky and calculate the welfare effect through increased variety (*see* SectionIX.A.2). Thus, the overcharge damages from Section IX.A.1and damages due to foregone varieties from Section IX.A.2do not add up to what I refer to as the total welfare effect damages. However, the overcharge damages from Section IX.A.1are included in the total welfare effect damages, and can be compared with them

B. Developer Marginal Costs

566. As noted above, my model requires that marginal cost not be equal to zero. A developer's marginal costs could potentially include customer support costs, hosting costs, user acquisition costs, salaries and wages, and costs associated with creating new versions and upgrading in-app content, to the extent these costs scale up with the number of downloads and sales of in-app content. Based on my review of evidence in the record, I find these costs are unlikely to be zero. [redacted][1139] [redacted][1140]

567. Those costs can be considered marginal costs because, to increase sales (or continue to generate sales in future periods) or support existing customers, an app would need to pay more for advertising and marketing and pay wages (that is, an app would need to keep buying labor hours to continue selling its app over time and providing customer support). In general, those labor hours

1139 [redacted]

1140 [redacted] *See* also GOOG-PLAY-001058642, at 682, 779 [redacted]

may, for example, include costs related to certain ongoing maintenance-related tasks after app development.[1141]

568. Advertising and marketing costs on their own can scale with sales and can be nontrivial. For example, "getting a game into the hands of players… includes testing, marketing, making a trailer, localisation, advertising" and so on.[1142] "For a bigger project[], marketing budget can equal up to 50% of the development budget."[1143]

569. Moreover, as noted below, developers use various methods to advertise their apps and many of those methods use cost per download/install/acquisition pricing strategies, and thus scale with sales:

- Cost-per-install (CPI) is a metric used to assess the cost a developer incurs for every additional install (customer) associated to some mobile app marketing campaign. Specifically, "publishers place digital ads across a range of media in an effort to drive installation of the advertised application. The brand is charged a fixed or bid rate only when the application is installed."[1144] CPIs may be nontrivial; for example, in 2021, the average mobile app CPI was $5.28 in North America.[1145]
- Customer Acquisition Cost (CAC) is a metric calculated by dividing total spend by the number of customers: "For example, if the same ad campaign cost $5,000 and it acquired 1000 new users, the CAC is $5,000/1000 or $5 per new user."[1146]

[1141] Ghose and Han (2014), p. 1474 ("[O]ngoing marginal costs arise from various maintenance tasks after app development…").

[1142] Auroch Digital, "How much does it cost to make a game?" August 24, 2021, available at https://www.aurochdigital.com/blog/2021/8/19/how-much-does-it-cost-to-make-a-game.

[1143] Rocket Brush Studio, "HOW MUCH DOES IT COST TO DEVELOP A GAME," May 6, 2022, available at https://rocketbrush.com/blog/how-much-does-it-cost-to-develop-a-game.

[1144] Dogtiev, Artyom, "Cost Per Install (CPI) Rates (2021)," *Business of Apps*, April 26, 2022, available at https://www.businessofapps.com/ads/cpi/research/cost-per-install/

[1145] Dogtiev, Artyom, "Cost Per Install (CPI) Rates (2021)," *Business of Apps*, April 26, 2022, available at https://www.businessofapps.com/ads/cpi/research/cost-per-install/

[1146] App Radar, "Key Metrics to Monitor for Subscription Apps," April 21, 2022, available at https://appradar.com/de/blog/key-metrics-to-monitor-for-subscription-apps.

- "CPA often stands for cost per action or cost per acquisition. This takes CPI one step further; not only does someone need to click on an ad, but they also need to take a designated action, like filling out a form or downloading an app, before an advertiser is charged. This pricing model is typically used by advertisers and marketers with ad campaign goals further down the proverbial funnel. Similarly, some campaigns - particularly for companies with an app-centric business model - work on a CPI (cost per install) basis."[1147]

570. For some apps, marginal cost may include content licensing costs, particularly for apps that offer streaming services like Netflix, SoundCloud, Sirius, Pandora, Spotify, etc. Such apps may use licensed intellectual property based on a per consumer/transaction basis. For example, Netflix uses statistical models to "determine expected hours of viewing for each piece of content over its license period" and compares "cost per hour viewed against other 'like' content deals (i.e., exclusive versus non-exclusive, TV versus movies, etc.)."[1148] In this way, it evaluates the content costs as an expected per unit measure. Netflix also incurs costs in producing original content and has increased its investment in original series and movies based on their success, a measure of which is their ability to generate the acquisition of new members and user engagement. In answers to its "Top Investor Questions," Netflix states: "Given the success we've had with our original series, we are increasing our investment in this area and we expect the % of our content spend on original series to increase over time," and "[w]e evaluate the performance of our originals several ways. We measure the impact of our originals on our ability to acquire new members and engagement, which is correlated with retention of existing members. We also seek reasonable economics relative to other exclusive content on a cost per hour viewed. We also take into account critical acclaim and awards for our originals and the impact original series may have on enhancing our brand and attractiveness of our service which helps with member growth."[1149] Thus, these costs

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[1147] Inmobi, "How Are In-App Advertising Rates Calculated?" January 22, 2019, available at https://www.inmobi.com/blog/2019/01/22/how-are-in-app-advertising-rates-calculated.

[1148] Matthew Ball, "Netflix Is a Product & Technology Company (Netflix Misunderstandings, Pt. 2)," May 12, 2018, available at https://www matthewball.vc/all/netflixproduct.

[1149] Netflix, "Top Investor Questions," available at https://ir netflix.net/ir-overview/top-investor-questions/default.aspx.

may be considered marginal cost because incurring costs to produce content would be associated with making additional sales. [redacted][1150]

571. Hosting and cloud computing costs are also marginal costs because they scale up with the number of users or usage.[1151] Developers can rent computing resources (servers) instead of buying a fixed amount of servers that run continuously. This approach allows developers to pay only for the capacity they use.[1152] For example, Epic Games and Netflix purchase such services.[1153] Finally, customer support and some maintenance costs are also marginal costs as they can scale with the number of users.[1154] Thus, collectively the evidence above suggests that the average marginal cost is not zero.

572. In my model, I assume that all developers have the same marginal cost c.That assumption is natural if firms set prices before learning their marginal cost.[1155] In that case, the

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1150 [redacted]

1151 Angerhofer, Tirza J. and Roger D. Blair, "Economic Reality at the Core of Apple," *The Antitrust Bulletin*, Vol. 66, No. 2, 2021, pp. 308-321 (hereafter "Angerhofer and Blair (2021)"), at p. 315 ("Consider an app that interacts with the internet in any way, such as online games, rideshare apps, or banking apps. In these cases, server traffic and therefore costs associated with additional server space and maintenance, which the app developer must bear, scale with the number of users."); *See* also, Francis, Paul, "Mobile App Maintenance Costs," *The BHW Group*, January 16, 2017, available at https://thebhwgroup.com/blog/mobile-app-maintenance-costs; VentureBeat, "Zoom's surging free user base dents margins as cloud costs rise," December 1, 2020, available at https://venturebeat.com/business/zooms-surging-free-user-base-dents-margins-as-cloud-costs-rise/.

1152 Amazon Web Services, "Amazon GameLift Pricing," available at https://aws.amazon.com/gamelift/pricing/.

1153 Amazon Web Services, "Epic Games Delivers Entertainment Experiences at Global Scale on AWS," 2021, available at https://aws.amazon.com/solutions/case-studies/epic-games/?did=cr_card&trk=cr_card; and Amazon Web Services, "Netflix on AWS," available at https://aws.amazon.com/solutions/case-studies/netflix/.

1154 Angerhofer and Blair (2021), p. 315 ("[T]he cost of user support may be directly related to volume. Although the App Store takes care of much of the support for downloading the apps, the app developers need to interact with users who have questions about the app itself."); Angerhofer and Blair (2021), footnote 33.

1155 Developers are likely to have a degree of uncertainty about marginal costs. [redacted] Also, CPI is likely to be uncertain to developers. [redacted] This bidding process determines CPI for a given sale. In this bidding process, a developer may end up paying less than its bid per install because developer "will only pay enough to beat the next best ad in the ad rank." *See* AppBrain, "The AppBrain advertising system," available at https://www.appbrain.com/info/help/advertiser-resources/adsystem.html. Uncertainty about marginal costs is also

interpretation of the marginal cost in my model is that it is an average marginal cost, which is an approximation to the reality in which developers have some uncertainty about various features of the market, including whether their app will be successful. A recent paper by Janßen et al., which uses data on apps in the Google Play Store to study the effect of the General Data Protection Regulation ("GDPR") in the EU on entry of new apps and innovation, finds "strong evidence that app success is unpredictable."[1156] Also, I show in Appendix F that the pricing equation that I derive closely approximates the average pricing equation that would arise in a model with heterogeneous marginal costs. While the costs discussed above may vary across different apps, the predicted price from my model approximates the average price that would arise, in that setting.

573. Finally, as long as the marginal cost is non-zero and an estimate of app's own-price demand elasticity is given, the level of actual price determines the magnitude of marginal cost. This follows from the Lerner's Index which states that price equals marginal cost multiplied by the markup over marginal cost. If markup is given, then the level (scale) of price determines marginal cost. For example, if markup is 1.5 and price is $9, then the implied marginal cost would be $9/1.5=$6. Now, under the same markup, if instead price is $18, the implied marginal cost would be $18/1.5=$12.[1157]

574. Moreover, if the marginal cost from the Lerner Index is more than what one would obtain using alternative methods for estimating marginal cost (*e.g.,* benchmarking or regression

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often assumed in economic literature. *See* for example Hansen, Gary D., "Indivisible labor and the business cycle," *Journal of Monetary Economics*, Vol. 16, Issue 3, 1985, pp. 309-327 (hereafter "Hansen (1985)"); Ireland, Peter N., "A method for taking models to the data," *Journal of Economic Dynamics and Control*, Vol. 28, Issue 6, 2004, pp. 1205-1226 (hereafter "Ireland (2004)"). Finally, some seminal work on firm entry assumes same marginal costs across firms. *See* for example Berry, Steven T., "Estimation of A Model of Entry in the Airline Industry," *Econometrica*, Vol. 60, No. 4, 1992, pp. 889-917, at p. 894; Bresnahan, Timothy F. and Peter C. Reiss, "Entry and Competition in Concentrated Markets," *Journal of Political Economy*, Vol. 99, No. 5, 1991, pp. 977-1009, at pp. 988-993.

[1156] Janßen, et al (2022) p. 22. For Dynamic Stochastic General Equilibrium models in macroeconomics that allow for aggregate technology shocks to the production process and hence uncertainties about the future marginal costs, *see* Hansen; (1985); Ireland (2004).

[1157] Using Lerner's index to recover marginal cost or elasticity is a standard methodology in economics. There are various methodologies and ways of using the information contained in the index to recover marginal costs or elasticities, but generally these methodologies make use of a firm's profit maximization condition (or price setting rule) to recover marginal cost or elasticity. *See*, *e.g*. Berry, S., J. Levinsohn, and A. Pakes, "Automobile prices in market equilibrium" *Econometrica*, Vol. 63, No. 4, July 1995, pp. 841–890 (hereafter "BLP (1995)") pp. 853-854, 875-885; Brynjolfsson et al (2003), p. 1586.

approach), that would indicate that my elasticity estimate is too conservative (*i.e.,* too high, which implies that I underestimate damages). Indeed, I am using the elasticity estimate from Ghose and Han (2014), which is more conservative than the estimate I derive using Google's data, as described in Section IX.C.As I showed above, a low marginal cost is rationalized by a higher markup over marginal cost in my model: if the marginal cost is low, then firms must be enjoying high markups that rationalize the observed high prices in the data. Firms can set high markups if consumers are less willing to substitute to competing apps (*i.e.,* if apps' own-price elasticity of demand is low). Furthermore, if apps' own-price elasticity of demand is low, then consumers value varieties more as they view each variety as being more unique and difficult to substitute to other varieties. In this instance, the damages due to foregone varieties would be higher.

575. An assumption in my model of entry is that all apps have the same expected quality. As described above, that is consistent with recent evidence from Janßen et al. (2022). They use the General Data Protection Regulation in the European Union, which imposed restrictions on the way in which apps may handle personal data, as an exogenous increase in the cost of producing and operating an app. They show that the GDPR reduced the number of new apps. However, the share of new apps which were successful did not change after the GDPR, which the authors interpret as evidence that app success is unpredictable.[1158]

C. Estimating Apps' Own Price Elasticity of Demand

576. My theoretical economic model generates a regression equation that is used to estimate apps' own price elasticity of demand, which is required to calculate the welfare effects through the increased varieties, total welfare effects, and associated damages. The regression estimates the effect of prices on the demand for apps and in-app content. A standard linear regression of log of quantity of items (apps or in-app content) purchased on the log of prices,[1159] in which I control for app, time, and app purchase type (*i.e.*, app download, subscription, or other type

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[1158] Janßen et al (2022), pp. 1, 22-24.

[1159] For a discussion of OLS method, *see* Wooldridge, Jeffrey M., *Introductory Econometrics: A Modern Approach*, Fifth Edition, Mason, OH: South-Western, Cengage Learning, 2009 (hereafter "Wooldridge (2009)"), Chapter 3.

of in-app content) fixed effects, may be problematic if prices are endogenous. That is, standard linear regression does not identify a causal relationship between prices and demand. I correct for such endogeneity by using an instrumental-variable ("IV") regression, which is a standard approach in econometrics.[1160] I use app and in-app content sales tax rates as instruments for prices, based on a framework in the academic literature.[1161] As explained by Zoutman et al. (2018), tax rates can serve as a source of exogenous variation in prices for consumers: "a standard assumption in models of taxation … is that the supply of a good depends on the before-tax price, whereas demand depends on the price after taxation."[1162] A technical description of the regression and how it relates to my damages model is included in Appendix F.

577. To estimate apps' own price elasticity of demand, I use the monthly app revenue data produced by Google, from which I calculate the quantity of transactions, prices, and tax rates on a monthly basis for each app package name and app purchase type combination in the data. I understand these data include paid- for purchases only; transactions relating to free purchases/downloads are not included in the data.[1163] In addition, I understand the data include U.S. consumers and worldwide developers.[1164] Relevant to my analyses, the data include the quantity of the product purchased by consumers, consumer expenditure on app and in-app content, sales taxes on those purchases, and the type of purchase (*i.e.*, paid download, subscription service, or other in-app content).

578. My regression results are presented in Exhibit 71 below.

[1160] For a discussion of IV method, *see* Wooldridge (2009), Chapter 15.

[1161] *See, e.g.,* Zoutman, Floris T., Evelina Gavrilova, and Arnt O. Hopland, "Estimating Both Supply and Demand Elasticities Using Variation in a Single Tax Rate," *Econometrica*, Vol. 86(2), 2018, pp. 763-771 (hereafter "Zoutman et al. (2018)"). *See also* Dearing, Adam, "Estimating structural demand and supply models using tax rates as Instruments," *Journal of Public Economics*, Vol. 205, 2022 (hereafter "Dearing (2022)").

[1162] Zoutman et al. (2018), p. 764.

[1163] Letter from Brian C. Rocca to Gregory Arenson, October 11, 2021.

[1164] *See* Letter from Brian C. Rocca to Melinda R. Coolidge, September 3, 2021, p. 2; Letter from Brian C. Rocca to Steve Berman, Hae Sung Nam, Yonatan Even, and Brendan Glackin, February 17, 2022, p. 1.

Exhibit 71

[redacted]

Notes:

1. ***, **, and * denote statistical significance at 1%, 5%, and 10% levels, respectively.
2. The data are limited to the following device types: "DEVICE_FRONTEND_PHONE," "DEVICE_FRONTEND_TABLET," and missing device type values.
3. The regression uses data for August 2016 to December 2021. The data are limited to the top apps by total consumer spending net of developer discounts between January 2012 and December 2021 that cover 95 percent of consumer spending net of developer discounts in the data.
4. Data are aggregated at year/month/app/purchase type level.
5. Price after tax is used in the regressions. Prices and tax rates are calculated using consumer spend net of developer discounts.
6. Data are demeaned to account for app fixed effects.
7. The IV model is implemented using 2SLS method and uses log of one plus sales tax rate as an instrument.
8. To determine whether the instrument is weak, I use Kleibergen-Paap rk Wald F-Statistic and Stock-Yogo critical values.

Sources: Google Monthly App Revenue Data.

579. As noted above, the linear specification indicates the need for an exogenous instrument that affects price independently of other demand drivers. Using log of tax rate plus one as an instrument, the IV specification provides a negative elasticity of -1.736.

580. In their paper, "Estimating Demand for Mobile Applications in the New Economy," Ghose and Han (2014) estimate an expected own price elasticity on Google Play using a nested logit demand model and a sample of paid and free apps on Google Play.[1165] Their expected own price elasticity estimate of -3.731 is not dissimilar from my result.[1166] In order to estimate welfare

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[1165] Ghose, Anindya and Sang Pil Han, "Estimating Demand for Mobile Applications in the New Economy," *Management Science*, Vol. 60, No. 6, 2014, pp. 1470-1488 (hereafter "Ghose and Han (2014)").

[1166] Ghose and Han (2014), p. 1482.

effects of increased varieties and corresponding damages, since the elasticity estimate from Ghose and Han (2014) produces slightly more conservative results than the elasticity estimate from my model, I have chosen to use their estimate. Moreover, Ghose and Han (2014) also use the expected own price elasticity of -3.731, that they estimate, to compare effects of different pricing strategies on app demand for various apps.[1167]

581. Models with a constant elasticity of substitution are used often in the economics literature. For example, in the international trade literature, the constant elasticity of substitution assumption has been used when studying trade between countries for a wide variety of differentiated goods, including papers published in the most highly regarded economic journals.[1168] For example, Bernard et al (2003) study the impact of dollar appreciation and globalization on productivity, plant entry and exit, and employment in U.S. manufacturing. Under the constant elasticity of substitution assumption, they analyze U.S. plant-level data that includes over 200,000 plants.[1169] Additionally, Nair et al (2004) study indirect network effects in the market for Personal Digital Assistants (PDAs), and, in estimating demand for software available on PDAs, they assume that consumers of software have constant elasticity of substitution preferences.[1170]

582. I also run several sensitivities on my baseline regression model, (i) keeping various combinations of device types; and (ii) using various thresholds to determine the top apps by total consumer spending net of developer discounts between August 2016 and 2021. The results are presented in Exhibit 72 and Exhibit 73 below.

[1167] Ghose and Han (2014), pp. 1482-1484.

[1168] *See, e.g.,* Helpman, Elhanan, Marc Melitz, and Yona Rubinstein. "Estimating trade flows: trading partners and trading volumes," *Quarterly Journal of Economics*, Vol. 123, No. 2, 2008, pp. 441-487; Bernard, Andrew, B., Jonathan Eaton, J. Bradford Jensen, and Samuel Kortum, "Plants and Productivity in International Trade," *American Economic Review*, Vol. 93, No. 4, 2003, pp. 1268-1290;

[1169] Bernard et al (2003), pp. 1269, 1273-74, 1282, 1289.

[1170] Nair, Harikesh, Pradeep Chintagunta, and Jean-Pierre Dube, "Empirical Analysis of Indirect Network Effects in the Market for Personal Digital Assistants," *Quantitative Marketing and Economics*, 2, 2004, pp. 23–58 (hereafter "Nair et al (2004)"), at p. 23 and p. 35.

Exhibit 72

[redacted]

Notes:

1. ***, **, and * denote statistical significance at 1%, 5%, and 10% levels, respectively.
2. The data for the regressions including "All Devices" are limited to "DEVICE_FRONTEND_PHONE," "DEVICE_FRONTEND_TABLET," "PLAY_RECURRENCE_TASK_SERVICE," "GOOGLE_TV," "PAYMENTS_BUY_FLOW," "BATTLESTAR_FRONTEND," and missing/unknown device types.
3. The data are limited to the top apps by total consumer spending net of developer discounts between 2012 and 2021 that cover 95 percent of consumer spending net of developer discounts in the data. Additionally, the regressions utilize data between August 2016 and 2021 only.
4. Data are aggregated at year/month/app/purchase type level.
5. Price after tax is used in the regressions. Prices and tax rates are calculated using consumer spend net of developer discounts.
6. Data are demeaned to account for app fixed effects.
7. The IV model is implemented using 2SLS method and uses log of one plus sales tax rate as an instrument.
8. To determine whether the instrument is weak, I use Kleibergen-Paap rk Wald F-Statistic and Stock-Yogo critical values.

Sources: Google Monthly App Revenue Data.

Exhibit 73

[redacted]

Notes:

1. ***, **, and * denote statistical significance at 1%, 5%, and 10% levels, respectively.

2. The data are limited to the top apps by total consumer spending net of developer discounts between 2012 and 2021 that cover 99, 97, 95, and 90 percent of consumer spending net of developer discounts in the data, respectively. Additionally, the regressions utilize data between August 2016 and 2021 only.
3. Data are aggregated at year/month/app/purchase type level.
4. Price after tax is used in the regressions. Prices and tax rates are calculated using consumer spend net of developer discounts.
5. Data are demeaned to account for app fixed effects.
6. The IV model is implemented using 2SLS method and uses log of one plus sales tax rate as an instrument.
7. To determine whether the instrument is weak, I use Kleibergen-Paap rk Wald F-Statistic and Stock-Yogo critical values.

Sources: Google Monthly App Revenue Data.

583. [redacted]

D. Methodology for Calculating Damages

584. In this section, I explain a methodology for quantifying damages based on the direct price effects, the welfare effect through increased variety, and total welfare effects described in Section IX.A. In Section IX.E,I then demonstrate my model's calculations of damages for consumers in the Plaintiff States, by year, for the periods August 16, 2016, through May 31, 2022, and August 16, 2016, through June 5, 2023. I also calculate damages for consumers in all states.

585. For my damages calculations, I use Google transactions data to assess damages to consumers by state, for the Plaintiff States, and year. I first aggregate these data at the state/app purchase type/year level. I understand these data include paid for purchases only; transactions relating to free purchases/downloads are not included in the data.[1171] In addition, I understand these data include U.S. consumers and worldwide developers.[1172] Relevant to my analyses, the data

[1171] Letter from Brian C. Rocca to Gregory Arenson, October 11, 2021, p. 2.

[1172] Letter from Brian C. Rocca to Melinda R. Coolidge, September 3, 2021, p. 2; Letter from Brian C. Rocca to Steve Berman, Hae Sung Nam, Yonatan Even, and Brendan Glackin, February 17, 2022, p. 1; Letter from Brian C. Rocca to Gregory Arenson, April 16, 2021, pp. 2-3; Letter from Brian C. Rocca to Gregory Arenson, May 5, 2021, p.2.

include quantity of the product purchased by the consumer as part of the transaction, consumer expenditure on app and in-app content, and the number of Play Points earned.

586. For each of the three damages effects (direct price effects, the welfare effect through increased varieties, and total welfare effects), I calculate three versions of damages corresponding to the hypothetical world in which Google does not have a monopoly in the Android App-Distribution Market, and hence there is competition in Android App Distribution, and also has not tied its Android app distribution services to the use of Google Play Billing:

- Pooled (Android App Distribution and Android In-App Billing Services) Markets with but-for commission and Play Points effects;
- Pooled (Android App Distribution and Android In-App Billing Services) Markets with but-for commission effects but no Play Points effects (*i.e.,* the but-for Play Points is set to equal actual Play Points); and
- Pooled (Android App Distribution and Android In-App Billing Services) Markets with but-for Play Points effects but no commission effects (*i.e.,* the but-for commission is set to equal actual commission);

587. Similarly, for each of the three damages effects (direct price effects, the welfare effect through increased varieties, and total welfare effects), I also calculate three versions of damages corresponding to the scenario in which Google has a legitimate monopoly in Android App Distribution but engages in anticompetitive tying:

- Android In-App Billing Services Market with but-for commission and Play Points effects;
- Android In-App Billing Services Market with but-for commission effects but no Play Points effects; and
- Android In-App Billing Services Market with but-for Play Points effects but no commission effects.

1. Direct Effect of Lower Commissions and Greater Play Points on Prices

588. The overcharge calculation is based on equation E.5 in Appendix F, which uses the following inputs for the quantification of damages:

- Consumer net expenditure, which is gross consumer expenditure net of Google and developer discounts;
- Google's actual commission, which is Google's commission (in $) as a share of the gross consumer expenditure net of developer discounts;
- Google's actual price discount to consumers, which is Google discounts, including Play Points, as a share of the gross consumer expenditure net of developer discounts;
- Google's but-for commission, which is 15 percent in both markets as explained in Sections VII and VIII; and
- Google's but-for price discount to consumers.

589. For the latter, I assume that, in a world in which Google faced competition in Android App Distribution, Google would have introduced its Play Points discounts to consumers earlier. As discussed in Section VII.B.4,several app stores have pursued direct discount/loyalty programs to retain or attract consumers, and Google introduced Play Points in Japan and Korea in response to competition from Amazon and OneStore. Google launched Play Points in South Korea approximately one year following the regulatory change in South Korea and ONE store's subsequent reduction of its commission to 20% (or 5% if developers choose their own billing service provider).[1173] While Google's discount/loyalty program for consumers may likely would have offered even more generous rewards in a world with greater competition, to be conservative I have assumed that the price discount due to Play Points in the but-for world would be comparable to

[1173] *See* Mu-Hyun, Cho, "Google Play introduces reward points in South Korea," ZDNet, April 22, 2019, available at https://www.zdnet.com/article/google-play-introduces-reward-points-in-south-korea/; Na, Hyun-joon and Minu, Kim, "Korean app market One Store vows to go global in 2022 with more popular games," Pulse, August 24, 2021, available at https://pulsenews.co.kr/view.php?year=2021&no=816068.

https://pulsenews.co.kr/view.php?year=2021&no=816068; GOOG-PLAY-000286779.R-847.R, at 842.R; GOOG-PLAY-000953420.R-460.R, at 422.R.

the same as the price discount in the actual world but that these discounts due to Play Points would have started earlier, approximately one year after the launch of the Google Play Store. I therefore extend Google's actual Play Points from the period 2020- May 2022 to previous years. More specifically, I (i) calculate the but-for price discount due to Play Points over 2020-May 2022 by dividing the dollar value of total Play Points (assuming 100 Play Points equals $1) by the gross consumer expenditure net of developer discounts; (ii) multiply this by the gross consumer expenditure net of developer discounts from August 16, 2016 through 2019; and (iii) add this amount to the actual Google discounts from August 16, 2016 through May 2022, and divide that by the gross consumer expenditure net of developer discounts from August 16, 2016 through May 2022.[1174]

590. Using equation E.5 in Appendix F, I calculate a common percentage overcharge across Plaintiff States and relevant years, which I multiply by the net consumer expenditure to obtain the damages. To allocate damages across relevant state/years, I use the corresponding net consumer spends. To account only for the share of smart mobile devices , in allocating damages across state/years, I multiply net consumer spend by the share of net consumer spend for smart mobile devices for each year using Google's monthly app revenue data.[1175]

591. Finally, to extrapolate damages up to June 5, 2023, I regress net consumer spend on a constant and time trend using data for the period 2018-May 2022 to estimate the parameters of the regression model which I then use to predict net consumer spend for the extrapolation period. Consequently, for the extrapolated period, I allocate net consumer spend proportionally by state according to the percent distribution of net spend over states for the years 2018 through 2019. To only account for the share of smart mobile devices in damages, for the extrapolated period, I calculate the compounded annual growth rate of the share of net consumer spend for phones, tablets

[1174] I reserve my rights to update this analysis, if requested, to assume that Google would have launched the Play Points program at a later date.

[1175] Note that Google in its correspondence regarding the transactions data stated that "We understand "device_class" may not be tracked accurately by Google and are investigating the burden of providing this information." (10/11/2021 Letter from Brian C. Rocca to Gregory Arenson, p.12). Thus, I use 'device_type' field from Google Monthly App Revenue Data to account for the device type in the damages calculations.

and missing device types from 2019 to 2021. I then apply that rate to the 2021 share to predict 2022 and 2023 phone and tablet shares.

2. *Welfare Effect through Increased Varieties (Apps)*

592. In addition to the parameters explained in Section IX.D.1 above, I need the following two parameters to quantify damages due to the welfare effects through increased variety in the but-for world, under the assumption that prices do not respond directly or indirectly to commission or Play Points:

- Apps' own-price elasticity of demand which, as explained above, I take from Ghose and Han (2014);
- Developer fixed cost which is required to predict the number of apps in the but-for world. This is calibrated from the model equation that is based on the free entry condition of apps. Intuitively, fixed cost affects app developers' entry decisions because it serves as a threshold on variable profits such that, if variable profits are larger than fixed cost, the apps would keep entering.

593. Given the parameters, I solve the model to find the amount of dollars that one would need to give to consumers in the actual world (under the actual prices and varieties) to make them as well of as they would be in the competitive but-for world in which prices are fixed at the actual level. This is equivalent to calculating the percentage increase in welfare (also referred to as a multiplicative factor in equation E.9 of Appendix F) and multiplying by the net consumer spend. I calculate a common percentage increase in welfare across Plaintiff States and relevant years. I then multiply by the net consumer spend to quantify damages. To allocate damages across relevant state/years, extrapolate to the future period, and account for only phones and tablets, I follow the same procedure as explained in Section IX.D.1 above.

3. *Total Welfare Effect of Lower Commissions or Greater Play Points*

594. To quantify total damages, I need the same set of parameters as for the variety effects damages above. Again, I use those parameters to solve the model to find the amount of dollars that one would need to give to consumers in the actual world (under the actual prices and

varieties) to make them as well of as they would be in the competitive but-for world. In this total welfare calculation, unlike the variety effect calculation, I allow the prices to change in the but-for world as predicted by my model.

595. As above, for the variety effects damages, I calculate the percentage increase in welfare (also referred to as a multiplicative factor in equation E.10 of Appendix F) and multiply by the net consumer spend. I calculate a common percentage increase in welfare across Plaintiff States and relevant years. I then multiply by net consumer spend to quantify damages. To allocate damages across relevant state/years, extrapolate to the future period, and account for only phones and tablets, I follow the same procedure as explained in Section IX.D.1 above.

E. Quantification of Damages to Consumers in the Plaintiff States

596. Using the methodology to calculate damages described above, I quantify damages to consumers for the relevant damages period and Plaintiff States. Damages across Plaintiff States and the relevant time period for the Pooled Android App Distribution and Android In-App Billing Services Markets are summarized in Exhibit 74 and Exhibit 75 below. Damages by Plaintiff State and year are presented in Appendix I.

Exhibit 74

[redacted]

Notes:
1. These figures utilize data for all states (excluding missing states) from August 16, 2016 through May 31, 2022.
2. To only account for the share of phones and tablets in damages, in allocating damages across state/years, I multiply net consumer spend by the share of net consumer spend for phones, tablets, and missing device types for each year using Google Monthly App Revenue Data.

Sources:
1. Google Transaction Data.
2. Google Monthly App Revenue Data.
3. Census State Code Crosswalk.

Exhibit 75

[redacted]

Notes:

1. These figures utilize data for all states (excluding missing states) from August 16, 2016 through May 31, 2022.
2. To only account for the share of phones and tablets in the damages, in allocating damages across state/years, I multiply net consumer spend by the share of net consumer spend for phones, tablets and missing device types for each year using Google Monthly App Revenue Data. For years 2022 through 2023, I calculate the compounded annual growth rate of the share of net consumer spend for phones, tablets and missing device types from 2019 to 2021. I then apply that rate to the 2021 share to predict 2022 and 2023 phone and tablet shares.
3. I extrapolate net spend for June 1, 2022 through June 5, 2023 using a regression of net consumer spend on a time trend and a constant, using 2018-2022 data from Google Monthly App Revenue Data and Google Transaction Data. Consequently, I allocate net consumer spend proportionally by state according to the percent distribution of net spend over states for the years 2018 through 2022.

Sources: See sources for Exhibit 74.

597. [redacted]

598. [redacted]

[redacted]

599. [redacted]

600. As explained in Section IX.A.3, the sum of direct effect and varieties effects damages is greater than total damages because prices are fixed in the varieties effect damages calculations while the total damages relaxes that assumption. As explained above, fixing the prices at the actual levels (*i.e.,* assuming prices do not go down in the but-for world) further incentivizes apps to enter and leads to more varieties compared to the case when prices fall in the but-for world.

601. Damages across Plaintiff States and the relevant time period for the In-App Billing Services Market are summarized in Exhibit 76 and Exhibit 77 below. Damages by Plaintiff State and year are presented in Appendix I. Damages for In-App Billing Services Market are similar to the damages for the Pooled Markets because consumer spending in the Google transaction data is heavily weighted toward in-app purchases.

602. [redacted]

603. [redacted]

[redacted]

604. [redacted]

Exhibit 76

[redacted]

Notes: See notes for Exhibit 74.

Sources: See sources for Exhibit 74.

Exhibit 77

[redacted]

Notes: See notes for Exhibit 75.

Sources: See sources for Exhibit 74.

605. In my model, I can solve for how developers set price in response to Google's commission or I can set the price for developers and solve for the other elements of the model, such

as the number of entrants and consumer harm. That is evidenced by the direct effects and total effects entries in the table, where I solve for app prices, or the variety effects entries, where I hold app prices constant. I can use this feature of the model to consider alternative rates at which app prices respond to Google's commission.

606. For instance, suppose I were to consider the case in which, in response to Google decreasing commission from 30% to 15%, developers decrease price by 50% of the decrease in what developers pay Google (per transaction). I can equate the change in price to 50% of change in payment and recover the implied new price. I can then fix this new price and resolve the model in a manner similar to the variety effects version. For example, if the average price is $9 when Google charges a 30% commission rate, then Google collects $2.7 for each transaction. When I consider 15% commission rate, I can set (new price-$9)=0.5*(0.15*(new price)-$2.7) and solve for the new price from this equation. This would give me the new price due to decrease in commission from 30% to 15% and under the assumption that developers decrease price by 50% of the decrease in what developers pay Google (per transaction). In this example, the new price would be about $8.27. In order to consider a 50% response rate, I can hold app prices constant at $8.27 and solve the remaining elements of the model in order to compute damages.

607. Counsel has not asked me to opine on the appropriate response rate to consider. Rather, we can see from the exhibits above that a response rate of 0% (the variety effects only calculation) generates damages lower than the total welfare version of damages which has approximately 100% response rate. Thus, to be extremely conservative, I adopt the variety effects entries as my proposed damages in this matter. However, I understand that other trial experts in this case may opine on the question of whether consumers may have felt less than 100% of the price effect due to market conditions. To the extent that other experts in this case opine that consumers felt less than 100% of the price effect of Google's conduct, I reserve the right in rebuttal to testify about the effect of those different assumptions on my model's calculations.

608. Counsel also asked me to quantify damages at the nationwide level during the damages period. Exhibit 78, Exhibit 79, Exhibit 80, and Exhibit 81 below provide the damages at the nationwide level.

Exhibit 78

[redacted]

Notes: See notes for Exhibit 75.

Sources: See sources for Exhibit 74.

Exhibit 79

[redacted]

Notes: See notes for Exhibit 75.

Sources: See sources for Exhibit 74.

Exhibit 80

[redacted]

Notes: See notes for Exhibit 75.

Sources: See sources for Exhibit 74.

Exhibit 81

[redacted]

Notes: See notes for Exhibit 75.

Sources: See sources for Exhibit 74.

X. Conclusion

609. Based on my review of the record and my analyses described above, I conclude that Google engaged in anticompetitive conduct that caused harm to competition and harmed Android smart mobile device users in the U.S. and worldwide (excluding China). My analysis demonstrates that Android App Distribution and Android In-App Billing Services are relevant antitrust markets for evaluating Google's challenged conduct. I find these markets are worldwide, excluding China. I demonstrate that Google has substantial market power in Android App Distribution and In-App Billing Services and that non-Android app stores do not constrain Google in these markets.

Moreover, I also conclude that Google uses its market power in Android App Distribution to tie the use of Google Play Billing for digital content on apps distributed through Google Play.

610. To assess the harm to consumers caused by Google's anticompetitive and exclusionary conduct, I develop a model of monopolistic competition between apps, based on Church and Gandal (1993), in which developers supply apps and in-app content and compete on prices charged to consumers. I use the model to calculate separate damages for two effects that a lower commission and more Play Points would have had, but for Google's anticompetitive conduct, on consumers' welfare, including a direct effect ("overcharge"), a welfare effect through increased varieties/apps, as well as a combined total effect.

611. I provide several measures of damages that variously hold entry constant, hold prices constant, or allow for a total effect on consumer welfare in response to Google's high commissions and low discounts. While the total welfare effect accounts for all of the economic effects of the high commissions and low discounts, to be conservative I take the minimum of the total welfare damages and variety damages, where, in the latter, I hold the price constant, (*i.e.*, no changes in app pricing in response to commission changes). [redacted]

Marc Rysman, Ph.D.
October 3, 2022

Appendix A
Curriculum Vitae of Marc Rysman

MARC RYSMAN
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EDUCATION

Ph.D. Economics, University of Wisconsin-Madison

B.A. Economics, Columbia University

PRIMARY ACADEMIC APPOINTMENTS

Professor, Boston University, 2011 to present

Associate Professor, Boston University, 2006 to 2011

Assistant Professor, Boston University, 1999 to 2006

VISITING POSITIONS

Visiting Scholar, Center for Consumer Payments Research, Federal Reserve Bank of Boston, 2009-2019

Visiting Scholar in Economics, Harvard University, 2014-2015

Visiting Associate Professor, Economics Department, Massachusetts Institute of Technology, 2007-2008

Visiting Scholar in Economics, Harvard University, 2003-2004

Visiting Fellow, Center for Studies in Industrial Organization, Northwestern University, May-June 2003

Visiting Scholar, Federal Reserve Bank of Minneapolis, July 2003

Research Assistant, Brookings Institution, 1992-1994

EDITORIAL POSITIONS

Editor, RAND Journal of Economics, 2014-2020

Editor, Review of Network Economics, 2010-2015

Associate Editor, Journal of Industrial Economics, 2010-2014

Associate Editor, The RAND Journal of Economics, 2007-2014

Associate Editor, International Journal of Industrial Organization, 2005-2014

Co-editor, Journal of Economics and Management Strategy, 2007-2010

OTHER PROFESSIONAL SERVICE

Advisory Committee on Interoperable Payment Systems Project for Innovations for Poverty Action, 2022

Program Committee for Asia-Pacific Industrial Organization Conference, December 2021

Scientific Committee for Online Seminar on the Economics of Platforms, Toulouse School of Economics, 2020 to present

Faculty affiliate to the Rafik B. Hariri Institute for Computing and Computational Science & Engineering, Boston University

Faculty affiliate to the Center for Innovation in Social Sciences, Boston University

Sponsorships, Industrial Organization Society, 2022

Secretary, Industrial Organization Society, 2018 to present

President, Industrial Organization Society, 2016-2017

Vice-President, President-Elect of Industrial Organization Society, 2014-2015

Academic Panel Member, Competition and Markets Authority, United Kingdom, 2016-2020

Organizing Committee, International Industrial Organization Conference 2008-2014

Organizer, Standards, Innovation and Patents Conference in Tucson. Sponsored by the NBER and USPTO. February 2012. Editor for special issue in IJIO

Organizing Committee, European Association for Research in Industrial Economics (EARIE) conference, Stockholm, 2011

Local Organizer, Summer Meetings of the North American Econometric Society, Boston University, 2009

UNIVERSITY SERVICE

Chair of the Department of Economics, 2020- present

Associate Chair of the Department of Economics, 2017-2020

Department Liaison to the Scientific Computing and Visualization Center, 2012- 2016

Merit and Equity Advisory Committee, 2001, 2002, 2009, 2014, 2016, 2019

Advisor to Second-year Graduate Students, 2013-2014, 2008-2009

Director, Junior Recruiting Committee, 2006-2007, 2009-2010, 2013-2014

Department newsletter, 2013

Chair, Academic Promotion and Tenure, College of Arts and Sciences, 2012-2013

Academic Promotion and Tenure, College of Arts and Sciences, 2011-2012

Discussion Facilitator in the Program in Responsible Conduct of Research for Graduate Students and Postdoctoral Researchers on March 31, 2011

College Teaching Prize Committee, Spring, 2011

Committee on Conflicts of Interest, 2008-2011

Co-director, Junior Recruiting Committee 2000-2001

Social Science Curriculum Committee, 2005-2007

Representative to CAS Reg-Prep (Registration Preparation)

Acting Director, Industry Studies Program, 2001-2002, 2009-2010

Summer Orientation Academic Advising, 2001, 2002, 2004, 2005

Junior Recruiting Committee 1999-2005

Undergraduate Studies Committee 1999-2005

INVITED LECTURES (SELECTED)

"Empirics of Network Effects," Plenary Talk, Conference on "Digital Platforms: Opportunities and Challenges," Toulouse School of Economics, October, 2020.

Panel on "The Current Economic Understanding of Multi-Sided Platforms," Competition and Consumer Protection Hearings, organized by the Federal Trade Commission at George Mason Law School, October, 2018.

"Antitrust in Digital Industries," Public Lecture organized by the Japanese Federal Trade Commission, Tokyo, March, 2014.

"Estimating Price-Cost Margins in a Dynamic Environment," Invited Lecture, European Association for Research in Industrial Economics (EARIE), Munich, September 2015.

"Payment Networks," Academic Consultants Conference for the members of the Board of Governors, Federal Reserve Bank, October 2011.

"Estimating Network Effects in a Dynamic Environment," Invited Lecture, European Association for Research in Industrial Economics (EARIE), Stockholm, September 2011.

"Adoption and Use of Payment Instruments by US Consumers," Keynote speech at conference entitled Payments Markets: Theory, Evidence and Policy, Granada, Spain. June, 2010.

"Platform Pricing at Sportscard Conventions," Plenary speech at conference entitled Platform Markets: Regulation and Competition Policy. Mannheim, Germany, May, 2010.

"Empirical Analysis of Payment Card Usage," Plenary session at Conference on Two-Sided Markets, Institut D'Economie Industrielle, Toulouse, January 2004.

INVITED SHORT COURSES

"Two-Sided Markets: From Theory to Empirics and Applications," Shanghai University of Finance and Economics, June 2017.

"Static and Dynamic Demand Estimation," for joint PhD program among Berlin universities, August 2014.

"Network Effects, Two-Sided Markets and Standard Setting," Fordham Competition Law Institute Training for Agency Economists. (I taught one section of a week-long training for competition authority economists from many countries.) June, 2007-June, 2013.

"Structural Econometrics in Industrial Organization," Hitotsubashi University, February 2009.

PUBLICATIONS

Leong, K., Li, H., Rysman, M., and Walsh, C. (2022). Law enforcement and bargaining over illicit drug prices: Structural evidence from a gang's ledger. *Journal of the European Economic Association*, 20:1198–1230.

Rysman, M. and Schwabe, R. (2021). Platform competition and the regulation of stock exchange fees. *Concurrences Competition Law Review*, (4):27–33.

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Celiktemur, C., Klein, A., Rysman, M., and Mani, V. (2021). Taming gatekeepers - but which ones? *Competition Policy International*.

Rysman, M., Simcoe, T., and Wang, Y. (2020). Differentiation in adoption of environmental standards: LEED from 2000-2010. *Management Science*, 66:4173–4192.

Chiou, L., Kafali, E. N., and Rysman, M. (2020). Internet use, competition, and geographical rescoping in Yellow Pages advertising. *Information Economics and Policy*, 52. Article 100867.

Chu, C. S. and Rysman, M. (2019). Competition and strategic incentives in the market for credit ratings: Empirics of the financial crisis of 2007. *American Economic Review*, 109:3514–3555.

Rysman, M. (2019). The reflection problem in network effect estimation. *Journal of Economics and Management Strategy*, 28:153–158. Named *Management Science* Top 10 most downloaded paper over two years.

Greene, C., Rysman, M., Schuh, S., and Shy, O. (2018). Costs and benefits of building faster payment systems: The U.K. experience. *Journal of Financial Transformation*, 47:51–66.

Rysman, M. and Schuh, S. (2017). New innovations in payments. In Greenstein, S., Lerner, J., and Stern, S., editors, *Innovation Policy and the Economy*, volume 17, pages 27–48. University of Chicago Press.

Falls, C., Friedman, P., and Rysman, M. (2016). The impact of the internet on distribution. In Banks, T., Langenfeld, J., and Wittrock, Q., editors, *Antitrust Law and Economics of Product Distribution*, chapter 10, pages 475–495. American Bar Association, second edition.

Rysman, M. (2016). Empirics of business data services. Appendix B of *Business Data Services Federal Notice of Proposed Rulemaking*, FCC 16-54.

Koulayev, S., Rysman, M., Schuh, S., and Stavins, J. (2016). Explaining adoption and use of payment instruments by US consumers. *RAND Journal of Economics*, 47:293–325.

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Rysman, M. and Wright, J. (2014). The economics of payment cards. *Review of Network Economics*, 13:303–353.

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WORKING PROJECTS

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Ho, C.-Y., Rysman, M., and Wang, Y. (2021). Demand for performance goods: Import quotas in the Chinese movie market. Unpublished manuscript, Boston University.

Chen, M., Rysman, M., Wang, S., and Wozniak, K. P. (2020). Payment instrument choice with scanner data: An MM algorithm for fixed effects in non-linear models. Unpublished manuscript, Boston University.

Gowrisankaran, G. and Rysman, M. (2020). A framework for modeling industry evolution in dynamic demand models. Unpublished Manuscript, Boston University.

Rapson, D. S., Rysman, M., and Wang, S. (2020). The impact of the Zero Emissions Vehicles mandate on the California automobile market.

Kaido, H., Li, J., and Rysman, M. (2018). Moment inequalities in the context of simulated and predicted variables. Unpublished manuscript, Boston University.

McCalman, P. and Rysman, M. (2019). Airline services agreements: A structural model of network formation. Unpublished Manucript, Boston University.

Cohen, M., Rysman, M., and Wozniak, K. (2017). Payment choice with consumer panel data. Unpublished Manuscript.

Gowrisankaran, G., Park, M., and Rysman, M. (2017a). Measuring network effects in a dynamic environment. Unpublished Manuscript, Boston University.

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Rysman, M. (2000). Competition policy as strategic trade. Industry Studies Project Working Paper, #100, Boston University.

GRANT ACTIVITY

"Estimation and Computation of Dynamic Oligopoly and Network Effects Models", with Gautam Gowrisankaran. National Science Foundation, SES-0922629, 2009-2013.

"Dynamic Demand for New Durable Goods: An Empirical Model and Applications to Pricing and Welfare," with Gautam Gowrisankaran. National Science Foundation, SES-0551348, 2006-2009.

"Discrete adjustment costs, investment dynamics, and productivity growth: Evidence from Chilean manufacturing plants", with Simon Gilchrist. National Science Foundation, SES-0351454, 2004-2006.

"Empirical Studies of Network Effects", National Science Foundation, SES-0112527, 2001-2002.

COURSES TAUGHT

EC333 Market Organization and Public Policy (Antitrust and Regulation): Fall 1999, Fall 2000, Spring 2002-2003, Spring 2005-2011, Fall 2008-2011, Spring 2016, Spring 2020, Fall 2020.

EC732 Topics In Industrial Organization (Graduate Empirical IO): Spring 2000-2001, Fall 2001, Spring 2003, Fall 2004, Spring 2005-2013, Spring 2016-2022.

EC711 Topics in Econometrics: Spring 2010-2011.

EC709 Advanced Econometrics II: Fall 2006, Fall 2015, Fall 2017-2018.

EC201/303 Intermediate Microeconomics: Fall 2001, Fall 2002, Fall 2005.

EC903 Graduate Student Seminar: Fall 1999, Fall 2000.

HONORS AND AWARDS

Neu Family Award for Teaching Excellence in Economics, 2006, 2012.

Networks, Electronic Commerce and Telecommunications (NET) Institute Grant, 2009.

Professor of the Year, 2006-2007, awarded by Boston University Fraternities and Sororities

Networks, Electronic Commerce and Telecommunications (NET) Institute Grant, 2005.

Networks, Electronic Commerce and Telecommunications (NET) Institute Grant, 2003.

Gerald M. Gitner Award for Excellence in Undergraduate Teaching, 2000.

Christensen Award in Empirical Economics, 1997 (with Phil Haile).

MEMBERSHIPS

American Economic Association

International Industrial Organization Society

TESTIMONY EXPERIENCE

- *Independent Living Resource Center of San Francisco, et al. v. Lyft, Inc.* (US District Court, Northern District of California, Case No. C-19-01438). Deposition in August 2020 and trial testimony in June 2021.
- *Twentieth Century Fox Film v. Wark Entertainment*, JAMS Ref. No. 1220052735. Deposition in June 2018 and trial testimony in August 2018.

OTHER LITIGATION AND REGULATORY EXPERIENCE

- Retained as a testifying expert by performing rights organization in the determination of the allocation of retransmission fees by the Copyright Royalty Board, 2022.
- Retained as a testifying expert by music publishers for antitrust counterclaims in a copyright infringement case, January 2020.
- Retained as a testifying expert by banks in a foreign antitrust case involving payment cards, 2018-2019.
- Retained as a testifying expert in a confidential FRAND Arbitration, Hong Kong International Arbitration Centre, 2019.
- Retained as an expert in a group of antitrust cases in the high-tech sector involving FRAND and unilateral conduct issues, 2018.
- Wrote "Stock Exchanges as Platforms for Data and Trading," for the New York Stock Exchange, which NYSE submitted to the SEC as part of a regulatory filing, December 2019. A follow-up report was filed in July 2020.
- Advocacy presentation to the Antitrust Division of the Department of Justice on a matter involving standard setting in a technology industry, March 2020.
- Wrote a white paper for the Federal Communication Commission studying market power in the business data services market, which influenced rulemaking: "Empirics of business data services." Appendix B of Business Data Services Federal Notice of Proposed Rulemaking, FCC 1654, 2016.
- Commissioned to write and present a paper on interchange fee policy and its effect on competition in the payments card market to the members of the Board of Governors of the Federal Reserve Bank. The paper was entitled "Payment Networks," and the event was formally titled as the "Academic Consultant's Conference for the members of the Board of Governors." September 2012. I presented directly to Chairman Bernanke, Vice Chairman Yellen and the rest of the Board of the Governors

OTHER CONSULTING EXPERIENCE

- Academic Panel Member, Competition and Markets Authority, United Kingdom, 2016 to 2020. I was called on periodically to provide advice on CMA cases.
- Served as an academic consultant to the Consumer Payments Research Center at the Federal Reserve Bank of Boston 2009-2019.
- Served as a consultant to the Association of Directory Publishers in their advocacy to various state and municipal governments on the benefits of competition in the Yellow pages market, 2007.

Appendix B
Materials Relied Upon

I. Expert Reports

- Expert Report of Dr. Stanley Presser, *Google Play Consumer Antitrust Litigation*, Case No. 3:20-cv-05761-JD, October 3, 2022.
- Expert Witness Report of James Mickens, *Google Play Consumer Antitrust Litigation*, Case No. 3:20-cv-05761-JD, October 3, 2022.

II. Depositions and Associated Exhibits

- Deposition of Adam Sussman, President at Epic Games, January 7, 2022.
- Deposition of Andrew Rubin, Founder of Android and formerly Google Vice President, May 17-18, 2022.
- Deposition of Christian Cramer, Finance Director for Play at Google, January 13-14, 2022.
- Deposition of Christopher Dury, CEO at GetJar, September 16, 2022.
- Deposition of Christopher Li, Director and Head of Product Growth at Google, May 24-25, 2022.
- Deposition of Daniel Vogel, Chief Operating Officer at Epic Games, May 23, 2022.
- Deposition of David Kleidermacher, Vice President, Engineering, at Google, February 3-4, 2022.
- Deposition of Donn Morrill, Director of Developer Relations for Entertainment Devices and Services at Amazon, August 11, 2022.
- Deposition of Edward Cunningham, Product Manager for Android at Google, July 21-22, 2022.
- Deposition of Eric Chu, Engineering Director at Meta Platforms and formerly Director of the Android Developer Ecosystem at Google, December 20, 2021 and January 14, 2022.
- Deposition of George Christopolous, Founder of SlideMe, September 9, 2022.

- Deposition of Haseeb Malik, Director of Mobile Publishing at Epic Games, March 4, 2022.
- Deposition of Hiroshi Lockheimer, Senior Vice President of Platforms & Ecosystems at Google, August 15-16, 2022.
- Deposition of James Kolotouros, Vice President, Android Platform Partnerships at Google, February 2-3, 2022.
- Deposition of Jamie Rosenberg, Vice President of Strategy and Operations, Platforms and Ecosystems Division, at Google, February 10, 2022.
- Deposition of Jonathan Gold, Finance Manager for Android at Google, June 23-24, 2022.
- Deposition of Kirsten Rasanen, formerly Business Development Director at Google, August 17, 2022.
- Deposition of Kobi Glick, Product Manager at Google, December 15-16, 2021.
- Deposition of Lacey Ellis, Developer Class Representative and Founder and CEO of LittleHoots LLC, March 22, 2022.
- Deposition of Lawrence Koh, General Manager and Head of FIFA Mobile at EA and formerly Director and Global Head of Games Business Development at Google, December 9, 2021.
- Deposition of Michael Marchak, Director of Play Partnerships, Strategy and Operations, at Google, January 12-13, 2022.
- Deposition of Mrinalini Loew, Product Lead for Google Play Commerce at Google, September 15, 2022.
- Deposition of Nick Sears, Android Co-founder at Google, July 1, 2022.
- Deposition of Patrick Brady, Vice President of Engineering for Android's Automotive Efforts at Google, April 21, 2022.
- Deposition of Paul Feng, Product Management Director at Google, January 14 and 18, 2022.

- Deposition of Paul Perryman, Vice President of Partnerships for the Americas at Netflix, September 28, 2022.
- Deposition of Richard Czeslawski, Developer Class Representative and Chief Operating Officer and President of Pure Sweat Basketball, March 21, 2022.
- Deposition of Ruth Porat, Chief Financial Officer at Google, September 15, 2022.
- Deposition of Sameer Samat, Vice President of Product Management at Google, February 2-3, 2022.
- Deposition of Sandra Alzetta, Vice President and Global Head of Payments at Spotify, September 29, 2022.
- Deposition of Sebastian Porst, Security Engineer and Manager Two at Google, July 13-14, 2022.
- Deposition of Tian Lim, Vice President, Engineering Product UX, at Google, December 2, 2021.

III. Data, Associated Documentation, and Correspondence

- AMZ-GP_00001497
- GOOG-PLAY-000042623.R
- GOOG-PLAY-000416245; GOOG-PLAY-010801682
- GOOG-PLAY-002076224.R
- GOOG-PLAY-003332817.R
- GOOG-PLAY-010801685.R

- App Annie Data

  "AZ004 - Q1_2_4_App_downloads_and_user_spend_v0.2.csv "; "AZ004 - Q3a_Proportion_of_Free_Apps_Google.csv"; "AZ004 - Q3b_Proportion_of_Free_Apps_Apple.csv"; "AZ004 - Q8a_Top_100_Developers_WW_exCN_Google_v0.2.csv"; "AZ004 - Q8b_Top_100_Developers_WW_exCN_Apple_v0.2.csv"; "AZ004 - Q8c_Top_1000_Developers_Global_Apple.csv"; "Notes, assumptions and caveats.xlsx"

- Census State Code Crosswalk

  "state_crosswalk.txt"

- Google Monthly App Revenue Data

  GOOG-PLAY-005535886; GOOG-PLAY-010801688

- Google Transaction Data

  GOOG-PLAY-007203251; GOOG-PLAY3-000018260

- IDC, "IDC Quarterly Mobile Phone Tracker," 2021Q4 Historical Release, February 11, 2022

  "IDC Mobile Phone Tracker_FinalHistoricalPivot CMI_2021Q4.xlsx"

IV. Produced Documents

- AMZ-GP_00000001
- AMZ-GP_00000259
- ATT-GPLAY-00000692
- ATT-GPLAY-00005216
- BUMBLE-00000001
- EPIC_GOOGLE_00006187
- EPIC_GOOGLE_01581798
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V. Other Case Documents

- "Declaration of Peter Foster in Support of Plaintiffs Match Group LLC's, Humor Rainbow INC.'s, Plentyoffish Media ULC's, and People Media INC.'s Motion for Temporary Restraining Order," *Match Group, LLC; Humor Rainbow, Inc; Plentyoffish Media ULC; and People Media, Inc. v. Google LLC; Google Ireland Limited; Google Commerce Limited; Google Asia Pacific PTE. Limited; and Google Payment Corp*., United States District Court for the Northern District of California San Francisco Division, Case No. 3:22-cv-02746-JD, May 10, 2022.
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- "Stipulation and [Proposed] Order on Match's Motion for Temporary Restraining Order," *Match Group, LLC, et al. v. Google LLC, et al*., the United States District Court for the Northern District of California San Francisco Division, Case No. 3:22-cv-02746-JD, May 19, 2022.
- Letter from Benjamin Bradshaw, Counsel for Defendants, to John Byars, Counsel for Consumer Plaintiffs, April 29, 2022.
- Letter from Brian C. Rocca, Counsel for Defendants, to Yonatan Even, September 23, 2022.
- Letter from Brian C. Rocca, Counsel for Defendants, to Melinda R. Coolidge, Counsel for Plaintiffs, September 3, 2021.
- Letter from Brian C. Rocca, Counsel for Defendants, to Brendan Benedict, Utah Office of the Attorney General, August 23, 2022.

- Letter from Brian C. Rocca, Counsel for Defendants, to Gregory Arenson, Counsel for Plaintiffs, April 16, 2021.
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VII. Internet Documents

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Appendix C
App Annie Top 100 Android App Developers, by Revenue, 2020

Developer	Revenue (2020)	Rank
Playrix	$854,449,063	1
NCSOFT	$768,303,873	2
King	$580,071,480	3
Supercell	$528,449,679	4
BANDAI NAMCO Entertainment Inc.	$469,803,341	5
LilithGames	$453,514,934	6
XFLAG, Inc.	$441,985,566	7
Moon Active	$441,751,698	8
Aniplex Inc.	$430,812,951	9
SQUARE ENIX Co.,Ltd.	$423,363,961	10
Netmarble	$408,292,884	11
Niantic, Inc.	$351,609,911	12
Google LLC	$350,886,614	13
Scopely	$303,789,222	14
Century Games Limited	$296,674,219	15
NEXON Company	$272,948,015	16
Roblox Corporation	$266,761,037	17
PROXIMA BETA	$266,149,795	18
IGG.COM	$247,639,272	19
LINE Corporation	$235,957,870	20
Zynga	$230,779,009	21
GARENA INTERNATIONAL I PRIVATE LIMITED	$229,623,662	22
Playtika	$222,653,461	23
KingsGroup Holdings	$215,361,579	24
Small Giant Games	$213,432,531	25
Long Tech Network Limited	$206,082,340	26
KONAMI	$197,562,535	27
ELECTRONIC ARTS	$191,326,441	28
Disney	$184,891,865	29
Peak	$177,545,447	30
SpinX Games Limited	$161,721,964	31
Com2uS	$161,052,928	32
Plarium Global Ltd	$159,822,443	33
Tinder	$151,924,514	34
Bigo Technology Pte. Ltd.	$149,363,176	35
miHoYo Limited	$148,521,614	36
SciPlay	$145,630,968	37
Product Madness	$139,562,592	38
Jam City, Inc.	$137,429,778	39
Activision Publishing, Inc.	$137,265,062	40

Gram Games Limited	$135,199,718	41
YottaGame	$132,481,770	42
GungHo Online Entertainment, Inc.	$129,647,701	43
Huuuge Games - Play Together	$126,311,946	44
NEXTERS GLOBAL LTD	$126,232,716	45
VIZOR APPS LTD.	$116,357,835	46
Camel Games Limited	$115,205,746	47
Nintendo Co., Ltd.	$114,779,921	48
Moonton	$112,524,589	49
NetEase Games	$111,267,642	50
Playtika Santa Monica	$109,446,026	51
4399 KOREA	$98,989,103	52
Big Fish Games	$97,774,897	53
Kabam Games, Inc.	$94,794,562	54
Warner Bros. International Enterprises	$93,541,752	55
Twitch Interactive, Inc.	$93,494,920	56
YOUZU(SINGAPORE)PTE.LTD.	$91,295,562	57
Pandora	$89,146,017	58
Kakao Games Corp.	$89,120,452	59
Webzen Inc.	$87,894,718	60
PLAYSTUDIOS INC	$86,497,871	61
Smilegate Megaport	$79,736,522	62
Magic Tavern, Inc.	$79,644,309	63
Rovio Entertainment Corporation	$78,802,305	64
KLab	$77,437,939	65
SEGA CORPORATION	$76,294,835	66
Crowdstar Inc	$75,944,492	67
Facebook	$74,631,717	68
Miniclip.com	$74,588,819	69
Ten Square Games	$74,024,584	70
GSN Games, Inc.	$72,793,671	71
Yostar Limited.	$70,763,662	72
My.com B.V.	$69,845,520	73
Cygames, Inc.	$68,509,849	74
PEARL ABYSS	$66,527,949	75
Playdemic	$65,815,453	76
Gamania Digital Entertainment Co Ltd	$64,997,836	77
Yostar, Inc.	$64,857,861	78
DeNA Co., Ltd.	$63,864,380	79
Mechanist Internet Technologies Co., Ltd.	$61,284,552	80

Gameloft SE	$60,752,305	81
Seriously Digital Entertainment Ltd.	$59,566,388	82
ONEMT	$59,565,006	83
Tactile Games	$59,045,924	84
CHUANG COOL ENTERTAINMENT	$58,960,546	85
Elex Wireless	$58,191,381	86
ZlongGames	$57,791,652	87
Glu	$57,075,380	88
Wooga	$56,590,713	89
Tango	$56,170,492	90
Jelly Button Games	$55,478,992	91
C4 Connect Inc.	$52,539,430	92
Hyperconnect inc	$52,097,594	93
Supertreat - A Playtika Studio	$51,756,312	94
Playtika UK â€“ House of Fun Limited	$51,459,782	95
Melsoft Games Ltd	$51,350,611	96
Mojang	$50,715,450	97
Fun Games For Free	$49,272,291	98
Wargaming Group	$48,645,974	99
COLOPL, Inc.	$47,848,819	100

Source: App Annie Data.

Appendix D
Summary of Google's Mobile Application Distribution Agreements with Large OEMs (excl. Europe)

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Appendix E
Google Discount Programs

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Commission Changes						
	Google lowered its commission for subscriptions, applicable only “for users retained after 12 months ”	2018 - 2021	Developers offering in-app subcriptions Reduced fee applies for users retained after 12 months of subscription	30% commission for the first year of subcription; 15% commission for users retained after a year of subscription		[23]
	For automatically renewing subscription products purchased by subscribers, the commission is 15%	2022 - present	Subscription services	15% commission for automatically renewing subscription products		[24], [25]
Project Runway	Google lowered its commission for developers' first $1 million of earnings they make each year for the sale of digital goods and services For earnings above $1 million, the standard commission applies	2021 - present	Developers must have “a payments profile,” “create an Account Group,” and “accept the Terms of Service for the 15% service fee tier ”	15% commission for first $1 million in earnings; 30% commission for earnings in excess of $1 million	To help small and medium businesses going through difficult times as a result of the COVID-19 pandemic and to compete with Apple's Small Business Program which offerend similar terms	[26], [27]

Sources:

[redacted]

23. El Khoury, Rita, "[Update: Now in effect] Google raises subscription revenue for providers from 70% to 85%, but only for users retained after 12 months," January 2, 2018, available at https://www.androidpolice.com/2018/01/02/google-raises-subscription-revenue-providers-70-85-users-retained-12-months/.

24. Li, Abner, "Google dropping Play Store subscription fee from 30% to 15% on day one for all Android devs," October 21, 2021, available at https://9to5google.com/2021/10/21/google-play-subscription-fee/.

25. Google, "Service fees," 2022, available at https://support.google.com/googleplay/android-developer/answer/112622?hl=en&visit_id=637872098045257136-3276584470&rd=1.

26. Deposition of Kobi Glick, Product Manager at Google, December 15-16, 2021, pp. 45-47.

27. Google, "Changes to Google Play's service fee in 2021," March 2021, available at https://support.google.com/googleplay/android-developer/answer/10632485#zippy=%2Cwhat-if-i-own-developer-accounts-that-dont-use-google-plays-billing-system.

Appendix F
Technical Appendix

I. Damages Model with Entry and Variety Effects

1. I develop a model of competition between apps in which developers supply apps and in-app content and compete on prices charged to consumers. My model is based on a classic model in the literature on indirect network effects: Church and Gandal (1993). The model generates formulae for estimating damages as a result of direct effects of changes in but-for commission or Play Points on app and in-app content prices as well as damages as a result of effects of changes in but-for commission or Play Points on the number of apps entering the markets. In addition, the model is used to estimate consumer choice (*i.e.*, number of available apps) and output effects of Google's anticompetitive conduct.

2. I consider a model with three periods. In period 1, a countably infinite number of identical firms simultaneously choose whether or not to enter. Firms that enter pay a fixed cost F. In period 2, firms that enter are indexed by $i = 1, \dots, n$. Firms choose the price of their product p_i. In period 3, a representative consumer chooses how much to buy of each product. I search for a subgame perfect Nash equilibrium.

3. I find the equilibrium by backward induction.

A. Consumers

4. Google Play Store has n apps. A representative consumer chooses the quantity of transactions q_i, at each app $i = 1, \dots, n$.[1] Let $\vec{q}$ be the $n \times 1$ vector of elements q_i. The utility function for the consumer is:

[1] An alternative to assuming that there is a single representative consumer that buys every app is to use a discrete choice model, that is, to assume there are a set of heterogeneous consumers that buy one app (or several apps). Representative agent and discrete models are closely related and have the same implications for many outcomes of interest. Intuitively, if we observe product-level quantity data (as opposed to individual level purchase data), we cannot distinguish just from data whether every consumer bought some of each product or different consumers bought each product. Thus, either modeling approach to such data can typically be mapped into the other approach. Anderson et al (1989) show how to map a CES model, such as used here, into a logit discrete choice model. (Anderson, Simon P., André De Palma, and Jacques-François Thisse, "Demand for Differentiated Products, Discrete Choice Models, and the Characteristics Approach," *The Review of Economic Studies*, Vol. 56, Issue 1, 1989, pp. 21-35 ("Anderson et al (1989)")

$$u(\vec{q}) = \left(\sum_{i=1}^{n} (a_i q_i)^{\frac{1}{\rho}}\right)^{\rho}$$

where $\rho > 1$ represents the degree of substitutability between transactions on different apps. The greater is ρ, the greater is the preference for variety.[2] The parameters a_i reflect the relative quality of each app. This utility function is a standard model in economics and underlies many classic models of competition, such as Dixit and Stiglitz (1977).[3]

5. The price of app i per transaction is p_i. Google Play also provides Play Points and other direct discounts to consumers on that posted price which is denoted by t_B. The final price paid by a consumer on a transaction is then $p_i(1 - t_B)$. The consumer has a budget y to spend on apps so the budget constraint is:

$$\sum_{i=1}^{n} p_i q_i = \frac{y}{1 - t_B}$$

6. The consumer chooses the quantity of transactions from each app subject to the budget constraint. Mathematically, the problem for the consumer is:

$$\max_{q_1,\dots,q_n} u(\vec{q}) \;\; s.t. \sum_{i=1}^{n} p_i q_i = \frac{y}{1 - t_B}$$

This leads to the demand system for each app i:

$$q_i(\vec{p}, \bar{p}) = \frac{y}{1 - t_B} \times \frac{(a_i \bar{p})^{\frac{1}{\rho - 1}}}{p_i^{\frac{\rho}{\rho - 1}}} \qquad \text{E. 1}$$

where:

[2] Let σ be own price elasticity of demand. Then, the relationship between ρ and σ is $\rho = \frac{\sigma}{\sigma - 1}$.

[3] Dixit, Avinash K. and Joseph E. Stiglitz, "Monopolistic Competition and Optimum Product Diversity," *The American Economic Review*, Vol. 67, No. 3, 1977, pp. 297-308 (hereafter "Dixit and Stiglitz (1977)"). Note that Dixit and Stiglitz (1977) analyze a general version of the CES utility function that allows for two nests. I use a special case of the utility function for my analyses.

$$\bar{p} = \left(\sum_{i=1}^{n} \left[\frac{p_i}{a_i}\right]^{\frac{-1}{\rho-1}}\right)^{1-\rho}$$

That is, $\bar{p}$ can be seen as a price index adjusted for the number of varieties that depends on app quality and the consumer's preference for variety. The more app choices, the better are the apps, and the more the consumer prefers variety, the lower is the effective price index.

7. Taking logs of both sides of the demand equation gives us an equation that is linear in parameters. I run a log-log regression of quantity of transactions on prices net of developer discounts to estimate the parameter $\frac{\rho}{\rho-1}$, which is the own-price elasticity. In that regression, I demean the data to account for app fixed effects, include time fixed effects, purchase type fixed effects, and use a measure of the sales tax rate to instrument for price as motivated by Zoutman et al. (2018).[4] The motivation for the instrument is that tax rates can serve as a source of exogenous variation in prices for consumers: "a standard assumption in models of taxation since Ramsay (1927) is that the supply of a good depends on the before-tax price, whereas demand depends on the price after taxation."[5] The results are summarized in Exhibit 71 in the report.

B. Firms

8. A firm producing (supplying) app i faces fixed cost F of developing the app and marginal cost c per transaction. A firm also does not know the actual quality of its app at the time of making the decision of whether to incur the fixed cost of developing the app and setting a price.[6] Its expected profit function is:

$$\pi_i(\vec{p}) = (1-\tau)p_i E(q_i) - cE(q_i) - F$$

[4] Zoutman, Floris T., Evelina Gavrilova, and Arnt O. Hopland, "Estimating Both Supply and Demand Elasticities Using Variation in a Single Tax Rate," *Econometrica*, Vol. 86(2), 2018, pp. 763-771 (hereafter "Zoutman et al. (2018)"). *See* also Dearing, Adam, "Estimating structural demand and supply models using tax rates as Instruments," *Journal of Public Economics*, Vol. 205, 2022.

[5] Zoutman et al. (2018), p. 764.

[6] *See* Janßen, Rebecca, Reinhold Kesler, Michael E. Kummer, and Joel Waldfogel, "GDPR and the Lost Generation of Innovative Apps," *NBER Working Paper Series*, 2022 (hereafter "Janßen et al (2022)"), p. 22 (finding "strong evidence that app success is unpredictable.").

9. Where τ is the commission charged by the Google Play Store and E is the expectation operator. I assume that all developers are ex-ante symmetric and hence have the same beliefs about potential app quality.[7] Plugging in from E. 1 we have:

$$\pi_i(\vec{p}) = \frac{((1-\tau)p_i - c)yE\left[(a_i\bar{p})^{\frac{1}{\rho-1}}\right]}{(1-t_B)p_i^{\frac{\rho}{\rho-1}}} - F$$

10. Each firm maximizes profit with respect to price p_i simultaneously in a Nash equilibrium. Firms account for the direct effect of p_i and the effect on the price index $\bar{p}$. The first order condition for app i is then:

$$(1-\tau)E\left[(a_i\bar{p})^{\frac{1}{\rho-1}}\right] + [(1-\tau)p_i - c] \times \left[\frac{E\left[(a_i\bar{p})^{\frac{2}{\rho-1}}\right]}{(\rho-1)p_i^{\frac{\rho}{\rho-1}}} - \frac{\rho E\left[(a_i\bar{p})^{\frac{1}{\rho-1}}\right]}{(\rho-1)p_i}\right] = 0$$

11. Under the symmetric Nash equilibrium, we have $p_i = p^* \ \forall i$. Substituting into the first order condition:

$$(\rho-1)(1-\tau)E\left[\frac{a_i^{\frac{1}{\rho-1}}}{\sum_{j=1}^{n} a_j^{\frac{1}{\rho-1}}}\right] + \left[(1-\tau) - \frac{c}{p}\right] \times \left[E\left[\left(\frac{a_i^{\frac{1}{\rho-1}}}{\sum_{j=1}^{n} a_j^{\frac{1}{\rho-1}}}\right)^2\right] - \rho E\left[\frac{a_i^{\frac{1}{\rho-1}}}{\sum_{j=1}^{n} a_j^{\frac{1}{\rho-1}}}\right]\right] = 0$$

12. Let $a_i = 1 \ \forall \ i$. Using this in the first order conditions and rearranging gives the symmetric Nash equilibrium price:[8]

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[7] This assumption is without loss of generality with respect to the optimal pricing of apps. If the number of apps is large enough, then apps do not consider the effect of their individual prices on price index (as that effect goes to zero as the number of apps becomes large). In such a case, even if apps know exactly about their quality before setting the prices, one can show that in equilibrium, the optimal price is $p^* = \frac{\rho c_i}{1-\tau}$, where c_i is marginal cost of app i. That is, prices do not depend on quality.

[8] An assumption to get to this simple formula is that all firms have marginal cost c. One way to think about this assumption is to consider apps that have imperfect knowledge about their marginal costs ex-ante. This is possible, for example, because developers face costs of user acquisition—marketing costs—on a per-user acquired basis, but

$$p^*(n,\tau) = \frac{(\rho n - 1)c}{(n-1)(1-\tau)}$$

E. 2

13. Let $\pi^*(n,\tau)$ be the equilibrium profit when there are n firms conditional on the commission. Under free entry, the equilibrium number of firms $n^*(\tau)$ is such that $\pi^*(n^*(\tau),\tau) = 0$ (ignoring integer constraints on n). We have:

$$\pi^*(n,\tau) = \left[(1-\tau) - \frac{c}{p^*(n,\tau)}\right] \times \frac{y}{(1-t_B)n} - F$$

E. 3

14. The optimal profits decline in both n and τ and increase in t_B.

15. Substituting for $p^*(n,\tau)$ in E. 3, I can solve for $n^*(\tau)$:

$$n^*(\tau) = \frac{1 + \frac{y(1-\tau)(\rho-1)}{(1-t_B)F}}{\rho}$$

E. 4

16. Given an estimate of ρ, E. 2 and E. 4 can be used to calibrate F and c.

C. Welfare Effects of τ and t_B

17. I calculate (1) the direct effect of the commission and Google's price discount on price (overcharge); (2) the welfare effect from increased app varieties, while shutting down the price effects (*i.e.* prices remain at the initial level); (3) total welfare effect of commission and Google's price discount.

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predicting ex ante the amount of advertising cost necessary is difficult because the cost of advertising depends on app success. That is, each app sets price based on an average marginal cost that equals to c. In that case, an interpretation of the marginal cost in my model is that it is an average marginal cost. Alternatively, if n is large enough, then apps do not consider the effect of their individual prices on the price index (as that effect goes to zero as n becomes large). If apps know their individual marginal costs exactly in such a case, equilibrium implies $p^* = \frac{\rho c_i}{1-\tau}$ where c_i is marginal cost of app i. If the average of c_i is equal to c in my model, then my model approximates the average price set by apps.

1. Direct Effect on Price

18. The direct effect on price refers to the effect of Google's conduct (through the commission and direct price discounts to consumers it has chosen) on prices holding fixed the number of apps. Let τ_1 denote the initial, actual, commission and τ_2 the new, but-for, commission. Also, let t_{B_1}denote the initial direct price discount rate and t_{B_2} the but-for price discount rate. Then the percentage overcharge due to direct effect of commission and Play Points on price is:

$$((1 - t_{B_2})p_2^* - (1 - t_{B_1})p_1^*)/((1 - t_{B_1})p_1^*) = \frac{\frac{(1 - t_{B_2})(\rho n - 1)c}{(n - 1)(1 - \tau_2)} - \frac{(1 - t_{B_1})(\rho n - 1)c}{(n - 1)(1 - \tau_1)}}{\frac{(1 - t_{B_1})(\rho n - 1)c}{(n - 1)(1 - \tau_1)}}$$

$$= \frac{(1 - \tau_1)(1 - t_{B_2}) - (1 - \tau_2)(1 - t_{B_1})}{(1 - \tau_2)(1 - t_{B_1})}$$

E. 5

19. This equation can be used to calculate damages due to the direct effect of commission and Play Points on price. Exhibit I.1 in Appendix I provides the following six versions of overcharge damages by Plaintiff State and year:[9]

- Pooled markets with but-for commission and Play Points;
- Pooled markets with only but-for commission effects (i.e. t_{B_2} is set to equal t_{B_1});
- Pooled markets with only Play Points effect (*i.e.*, τ_2 is set to equal τ_1);
- Android In-App Billing Services Market with but-for commission and Play Points;
- Android In-App Billing Services Market with only but-for commission effects (i.e. t_{B_2} is set to equal t_{B_1}); and
- Android In-App Billing Services Market with only Play Points effect (*i.e.*, τ_2 is set to equal τ_1).

[9] Appendix J contains a similar exhibit with yearly damages for all states and U.S. administrative areas in the data.

20. I calculate a common overcharge over August 16, 2016- May 31, 2022. As described in Section VII of my report, the but-for commission is set to be 15% for the pooled markets damages and is common across all years and states. As further described in Section VIII of my report, the but-for commission is set to be 15% percent for the In-App Billing Services market damages in the scenario in which Google has a legitimate monopoly in the Android App-Distribution Market but engages in anticompetitive tying. To calculate the but-for Google price discount, I (i) calculate the price discount due to Play Points over January 1, 2020-May 31, 2022 by dividing the dollar value of total Play Points (assuming 100 Play Points equals $1) by the gross consumer expenditure net of developer discounts; (ii) multiply this by the gross consumer expenditure net of developer discounts over August 16, 2016-December 31, 2019; and (iii) add this amount to the actual Google discounts over August 16, 2016-May 31, 2022 and divide that by the gross consumer expenditure net of developer discounts over August 16, 2016-May 31, 2022.

21. To allocate the overcharge damages to the Plaintiff States during the relevant period (at the annual level), I use the respective net consumer expenditure in each Plaintiff State/year. I drop missing state names in the Google Transaction Data starting from August 1, 2016.[10]

22. I extrapolate damages up through the scheduled trial start date of June 5, 2023. To do so, I use data from January 1, 2018-May 31, 2022 to estimate a time trend by running a regression of net consumer spend on a constant and time trend which I use to predict the values in each month from June 2022 to June 5, 2023, accounting for the number of days in the partial month. Consequently, I allocate net consumer spend proportionally by state according to the percent distribution of net spend over states for the years 2018 through 2019.

[10] Letter from Brian C. Rocca to Brendan Benedict, "Re: In re Google Play Store Antitrust Litigation, No. 3:21-md-02981-JD (N.D. Cal.); In re Google Play Consumer Antitrust Litigation, No. 3:20-cv-05761-JD (N.D. Cal.); Epic Games, Inc. v. Google LLC et al., No. 3:20-cv-05671-JD (N.D. Cal.); State of Utah, et al. v. Google LLC et al., No. 3:21-cv-05227-JD (N.D. Cal.); Match Group, LLC et al. v. Google LLC et al., Case No. 3:22-cv-02746-JD," August 23, 2022, p. 1 ("Google has sampled a number of transactions where the 'state' information is missing and confirms that for the period August 2016 to July 2021, these are test purchases for which 'state' information is not required.").

23. Finally, I use the annual shares of phones and tablets from Google Monthly App Revenue Data[11] to restrict damages to consumer spend on phone and tablet devices.[12]

2. Welfare Effect Through Increased Variety

24. Here, I set but-for price to its initial level, p_1^*, *i.e.* the price does not respond either directly or indirectly to τ. Even if developers do not lower app and in-app content prices, they would still earn greater revenues, and hence higher profits, under a lower but-for τ or higher t_B. This further incentivizes more firms to enter and launch more apps and in-app content on the platform. Consumers are better off because they intrinsically value the variety of apps available on the platform. I calculate the change in consumer welfare due to increased variety and then convert the welfare change to dollars.

25. Using the consumer's utility function and demand system, the consumers' indirect utility is calculated as:

$$V(p, n) = \frac{y}{(1 - t_B)} \times \frac{n^{\rho - 1}}{p}$$

26. I ask what is the equivalent amount of dollars, denoted by Δy, that one should give a consumer to make her as happy as if the commission was τ_2 instead of τ_1 and the discount was t_{B_2} instead of t_{B_1} (*i.e.,* I do not decrease τ_1 to τ_2 and do not increase t_{B_1} to t_{B_2} but instead give the consumer compensation that makes her as well off). This translates into solving the following for Δy:

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[11] To extrapolate the share for January 1, 2022, to June 5, 2023, I take the compound annual growth rate of this share from 2019 to 2021 and project the share in subsequent years. I also treat missing device types in the Google's monthly app revenue data as part of phones and tablets.

[12] Note that Google in its correspondence regarding the Google Transaction Data stated that "We understand "device_class" may not be tracked accurately by Google and are investigating the burden of providing this information." *See* Letter from Brian C. Rocca to Gregory Arenson, "Re: In re Google Play Store Antitrust Litigation, No. 3:21-md-02981-JD (N.D. Cal.); Epic Games, Inc. v. Google LLC et al., No. 3:20-cv-05671-JD (N.D. Cal.); In re Google Play Consumer Antitrust Litigation, No. 3:20-cv-05761-JD (N.D. Cal.); In re Google Play Developer Antitrust Litigation, No. 3:20-cv-05792-JD (N.D. Cal.); State of Utah, et al. v. Google LLC et al., No. 3:21-cv-05227-JD (N.D. Cal.)," October 11, 2021, p. 12. Thus, I use 'device_type' field from the Google Monthly App Revenue Data to account for the device type in the damages calculations.

$$\frac{(y + \Delta y)}{(1 - t_{B_1})} \times \frac{n_1^{\rho-1}}{p_1^*} = \frac{y}{(1 - t_{B_1})} \times \frac{n_2^{\rho-1}}{p_1^*}$$

27. The solution is:

$$\Delta y = y \times \left[\frac{n_2^{\rho-1}}{n_1^{\rho-1}} - 1\right]$$

E. 6

28. The actual number of apps n_1 is observed in the data. To derive n_2, I use the following version of E. 3 as a free entry condition:

$$\left[(1 - \tau_2) - \frac{c}{p_1^*}\right] \times \frac{y}{(1 - t_{B_2})n_2} - F = 0$$

29. This profit is obtained by fixing $p^* = p_1^*$; allowing for higher revenues per unit of quantity under τ_2, which is $(1 - \tau_2)p_1^*$; and using consumer demand that is evaluated at p_1^* but allows for higher discount and more varieties *i.e.,* the price index aggregates across n_2 varieties with each product having price p_1^*.

30. The free entry condition gives:

$$n_2 = \frac{y}{(1 - t_{B_2})F} \times \frac{((1 - \tau_2)p_1^* - c)}{p_1^*}$$

E. 7

31. Provided that we have estimates of marginal and fixed costs, we can recover n_2 and plug into E. 6 to calculate Δy.

32. Using E. 3, n_1 can be expressed as:

$$n_1 = \frac{y}{(1 - t_{B_1})F} \times \frac{((1 - \tau_1)p_1^* - c)}{p_1^*}$$

E. 8

33. Dividing E. 7 by E. 8, we have:

$$\frac{n_2}{n_1} = \frac{((1 - \tau_2)p_1^* - c)}{((1 - \tau_1)p_1^* - c)} \frac{(1 - t_{B_1})}{(1 - t_{B_2})}$$

34. Substituting for p_1^* in the above expression gives:

$$\frac{n_2}{n_1} = \frac{\left(\rho y(1-\tau_2) - y(1-\tau_1) + \left(1-t_{B_1}\right)F\right)}{\left((\rho-1)y(1-\tau_1) + \left(1-t_{B_1}\right)F\right)}\frac{(1-t_{B_1})}{(1-t_{B_2})}$$

35. Substituting the latter into E. 6, we obtain:

$$\Delta y = y \times \left(\left[\frac{\left(\rho y(1-\tau_2) - y(1-\tau_1) + \left(1-t_{B_1}\right)F\right)}{\left((\rho-1)y(1-\tau_1) + \left(1-t_{B_1}\right)F\right)}\frac{(1-t_{B_1})}{(1-t_{B_2})}\right]^{\rho-1} - 1\right)$$

E. 9

36. This equation is used to calculate damages as a result of forgone varieties under the assumption that prices do not decrease in the but-for world. Exhibit I.2 in Appendix I provides the following six versions of damages by Plaintiff State and year due to welfare effect through increased variety:[13]

- Pooled markets with but-for commission and Play Points;
- Pooled markets with only but-for commission effects (i.e. t_{B_2} is set to equal t_{B_1});
- Pooled markets with only Play Points effect (i.e. τ_2 is set to equal τ_1);
- Android In-App Billing Services Market with but-for commission and Play Points;
- Android In-App Billing Services Market with only but-for commission effects (i.e. t_{B_2} is set to equal t_{B_1});
- Android In-App Billing Services Market with only Play Points effect (i.e. τ_2 is set to equal τ_1).

37. Similar to how I calculate the direct price effect, I calculate a common multiplicative factor equal to the expression inside the parenthesis of equation E. 9. I calibrate the own-price elasticity using the estimate from Ghose and Han (2014). I calibrate the fixed cost, F, using equation E. 4 evaluated at the actual world values. To allocate the damages to the Plaintiff States during the relevant period (at the annual level), I use respective net consumer spend in each Plaintiff State/year.

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[13] Appendix J contains a similar exhibit with yearly damages for all states and U.S. administrative areas in the data.

D. Total Welfare Effect

38. The total welfare effect (in \$) due to a lower commission and higher Play Points in the but-for world is represented as:

$$\Delta y = y \times \left[\frac{p_1(1-t_{B_1})}{p_2(1-t_{B_2})}\frac{n_2^{\rho-1}}{n_1^{\rho-1}} - 1\right]$$

39. For an illustration, this can be decomposed as follows:

$$\begin{aligned}\Delta y = y \times \left[\frac{p_1(1-t_{B_1})}{p_2(1-t_{B_2})}\frac{n_2^{\rho-1}}{n_1^{\rho-1}} - 1\right] &\geq y \times \left[\frac{p_1(1-t_{B_1})}{p_2(1-t_{B_2})} - 1\right] + y \times \left[\frac{n_2^{\rho-1}}{n_1^{\rho-1}} - 1\right] \\ &= Q_2 p_2(1-t_{B_2}) \times \left[\frac{p_1(1-t_{B_1})}{p_2(1-t_{B_2})} - 1\right] + y \times \left[\frac{n_2^{\rho-1}}{n_1^{\rho-1}} - 1\right] \\ &\geq Q_1 p_2(1-t_{B_2}) \times \left[\frac{p_1(1-t_{B_1})}{p_2(1-t_{B_2})} - 1\right] + y \times \left[\frac{n_2^{\rho-1}}{n_1^{\rho-1}} - 1\right] \\ &= Q_1\left[(1-t_{B_1})p_1 - (1-t_{B_2})p_2\right] + y \times \left[\frac{n_2^{\rho-1}}{n_1^{\rho-1}} - 1\right]\end{aligned}$$

40. The first inequality follows from observing that $\frac{p_1(1-t_{B_1})}{p_2(1-t_{B_2})} \geq 1$ and $\frac{n_2^{\rho-1}}{n_1^{\rho-1}} \geq 1$. The second inequality follows from observing that $Q_2 \geq Q_1$ where capital Q denotes total number of transactions. This illustrates that the total welfare loss for consumers is at least as large as the damages from the direct effect on price estimated in the previous section.[14]

41. I substitute the equilibrium expressions for $p_1, p_2, n_1,$ and n_2 in the expression for the total welfare change and arrive at the following equation which is used to calculate the total damages:

[14] I underestimate the damages from the direct effect on price using the method in Section C.1 for two reasons: (1) as illustrated by the last inequality in the equation above, the total harm to consumer welfare should be evaluated incorporating the output effects (*i.e.*, at Q_2), and (2) when estimating the damages from the direct effect on price, I do not use p_2, the but-for price, but instead use the higher but-for price assuming there was no change in the number of firms.

$$\Delta y = y \times \left[\left(\frac{(y(1-\tau_2) - (1-t_{B_2})F)(1-t_{B_1})}{(y(1-\tau_1) - (1-t_{B_1})F)(1-t_{B_2})} \right) \times \left(\frac{(y(1-\tau_2)(\rho-1) + (1-t_{B_2})F)(1-t_{B_1})}{(y(1-\tau_1)(\rho-1) + (1-t_{B_1})F)(1-t_{B_2})} \right)^{\rho-1} - 1 \right]$$

E. 10

42. Exhibit I.3 in Appendix I provides the following six versions of total damages by Plaintiff State and year:[15]

- Pooled markets with but-for commission and Play Points;
- Pooled markets with only but-for commission effects (i.e. t_{B_2} is set to equal t_{B_1});
- Pooled markets with only Play Points effect (i.e. τ_2 is set to equal τ_1);
- Android In-App Billing Services Market with but-for commission and Play Points;
- Android In-App Billing Services Market with only but-for commission effects (i.e. t_{B_2} is set to equal t_{B_1});
- Android In-App Billing Services Market with only Play Points effect (i.e. τ_2 is set to equal τ_1).

E. Consumer Choice and Output Effects of Google's Anticompetitive Conduct

43. To calculate a percentage increase in the number of apps in the but-for world, I use the following expression:

$$\frac{n_2}{n_1} - 1 = \frac{(y(1-\tau_2)(\rho-1) + (1-t_{B_2})F)(1-t_{B_1})}{(y(1-\tau_1)(\rho-1) + (1-t_{B_1})F)(1-t_{B_2})} - 1$$

[15] Appendix J contains a similar exhibit with yearly damages for all states and U.S. administrative areas in the data.

E. 11

44. To estimate the output effects in each year, I use the symmetric Nash Equilibrium condition, $p_i = p^* \, \forall i$, in E. 1 and sum up the output to get the total output across all apps (denoted by Q). I arrive at:

$$Q = \frac{y}{(1 - t_B)p^*}$$

E. 12

45. Consequently, conservatively assuming that there is only a direct effect of commission on price, I use E. 2 in the expression above and arrive at:

$$Q_2 = Q_1 \frac{(1 - \tau_2)}{(1 - \tau_1)} \frac{(1 - t_{B_1})}{(1 - t_{B_2})}$$

E. 13

II. Model Adaptation for SSNIP Calculation

46. I can also adapt the model described above to investigate whether a hypothetical monopolist of both Android In-app Billing Services and Android App Distribution would find it profitable to impose a SSNIP of 10%. That is, the question is whether the markets are no broader than Android In-app Billing Services and App Distribution. These adjustments are set out in the sections below.

A. SSNIP Model

47. I start with the hypothetical monopolist's profit function at the competitive price, which is written as:

$$\Pi = ((\tau^* - t_B^*) \times p^*(\tau^*, t_B^*) - C) \times Q^*(\tau^*, t_B^*)$$

48. Where the price p^* is the price of app/in-app content, Q^* is the number of transactions (downloads and in-app purchases), τ^* is the competitive commission paid by apps per sale which is 15% for transactions corresponding to either download or in-app purchase, t_B^* is the competitive price discount to consumers, and C is the hypothetical monopolist's marginal cost. Hence, $p^*(\tau^*, t_B^*) \times Q^*(\tau^*, t_B^*)$ is the total expenditure on app and in-app content and $(\tau^* - t_B^*) \times p^*(\tau^*, t_B^*) \times Q^*(\tau^*, t_B^*)$ is the hypothetical monopolist's revenue. In what follows, I will

use a shorthand to write price and quantity of transactions without explicitly indicating that they are functions of commission or other parameters of the model.

49. The hypothetical monopolist imposes SSNIP on both the competitive commission and the competitive price discount. Therefore, a 10% SSNIP on τ^* and a 10% SSNIP on price discount would be profitable for a hypothetical monopolist if:

$$((1.1\tau^* - 0.9t_B^*)p^{**} - C)Q^{**} > ((\tau^* - t_B^*)p^* - C)Q^*$$

50. Where p^{**} and Q^{**} denote the price of app/in-app content and the number of transactions after the hypothetical monopolist has imposed a 10% SSNIP, respectively. Let $Q^{**} = Q^* - \Delta Q^*$, that is Q^{**} can be decomposed into the initial competitive but-for number of transactions minus the reduction in the transactions due to higher prices and commission. Using this decomposition in the expression above and rearranging gives:

$$C \geq \frac{\frac{\Delta Q^*}{Q^*}(1.1\,\tau^* - 0.9t_B^*)p^{**} - (1.1\tau^* - 0.9t_B^*)p^{**} + (\tau^* - t_B^*)p^*}{\frac{\Delta Q^*}{Q^*}}$$

E. 14

51. The right-hand side of equation E. 14 is a threshold such that if the hypothetical monopolist's marginal cost is larger than the threshold then the SSNIP is profitable and hence the markets are no broader than App Distribution and In-App Billing Services on Android.

52. Finally, dividing the numerator and denominator of the right-hand side of E. 14 by the percentage change in price, I obtain the following expression:

$$C \geq \frac{\epsilon_{Q,p}(1.1\,\tau^* - 0.9t_B^*)p^{**} - \frac{[(1.1\tau^* - 0.9t_B^*)p^{**} - (\tau^* - t_B^*)p^*]p^*}{p^{**} - p^*}}{\epsilon_{Q,p}}$$

E. 15

53. Where $\epsilon_{Q,p}$ denotes the negative of the percentage change in total equilibrium quantity on the markets as a result of SSNIP divided by the percentage change in price as a result of SSNIP.

54. The right-hand side of E. 15 is the critical marginal cost threshold that I estimate.[16] If the hypothetical monopolist's marginal cost is larger than that critical threshold, then the SSNIP is profitable, and the markets are no broader than App Distribution and In-App Billing Services on Android.

B. Adapted App Competition Model

55. In my damages model, a consumer has a fixed budget to allocate across content; that is, y is constant in the model. This implies that y will not change if a hypothetical monopolist increases commission or decreases discount. To allow for the potential changes in the budget in response to the changes in commission or Play Points, I extend the damages model to a nested utility CES model with an outside good.[17] This type of model potentially allows $\epsilon_{Q,p}$ to be more than 1.[18] This approach would be conservative for the SSNIP analysis if it generates $\epsilon_{Q,p} > 1$. Under higher $\epsilon_{Q,p}$, a SSNIP would become less profitable for a hypothetical monopolist.[19]

56. In what follows, I solve a model which has a potential to provide a more conservative framework for the SSNIP analysis. The model is used to obtain $\epsilon_{Q,p}$ and prices that feed into the equation E. 15.

57. I consider a model with three periods. In period 1, a countably infinite number of identical firms simultaneously choose whether or not to enter. Firms that enter pay a fixed cost F. In period 2, firms that enter are indexed by $i = 1, \ldots, n$. Firms choose the price of their

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[16] The formula in E.15 of this appendix that provides the critical marginal cost threshold does not depend on the specific model of competition or method of calibration explained below and that I have used in this report. I reserve the right in future reports, as I review the record further, to use an alternative model, calibration method, or rate response.

[17] *See* Dixit and Stiglitz (1977). Note that Dixit and Stiglitz (1977) analyze a general version of the CES utility function with two nests. I use a special case of the utility function for my analyses.

[18] Note that the fixed budget implies that this $\epsilon_{Q,p}$ is 1 in the damages model. *See* equation 12.

[19] Note that in the hypothetical competitive but-for world, the market share of the hypothetical monopolist would also be higher because it would serve not only the Google's actual world market share but also the portion outside the Google's market share in the actual world. However, note that if I scale up the quantity and revenue of the hypothetical monopolist in the same way, then this results in scaling up the hypothetical monopolist's profit function and does not affect the SSNIP analysis.

product p_i. In period 3, a representative consumer chooses how much to buy of each product. I search for a subgame perfect Nash equilibrium.

58. I find the equilibrium by backward induction.

1. ***Consumer***

59. Starting in the final period, the representative consumer chooses how much to purchase of each product i, denoted by q_i. The n vector of quantities is denoted $\vec{q}$. In addition, the consumer may purchase an outside good z. Prices are p_i, with p_z normalized to $p_z = 1$. The consumer has a nested CES utility function:

$$u(\vec{q}, z) = \left(\left(\sum_{i=1}^{n} (q_i)^{\frac{1}{\rho}} \right)^{\frac{\rho}{\alpha}} + z^{\frac{1}{\alpha}} \right)^{\alpha}$$

where $\rho > 1$ represents the degree of substitutability between transactions on different apps, and $\alpha > 1$ represents the degree of substitutability between the outside good and the *composite app good* (defined below).

60. The hypothetical monopolist provides Play Points and other direct discounts to consumers on that posted price which is denoted by t_B. The final price paid by a consumer on a transaction is then $p_i(1 - t_B)$. The consumer has the income m to spend on apps and the outside good so the budget constraint is:

$$\sum_{i=1}^{n} p_i q_i + \frac{z}{1 - t_B} = \frac{m}{1 - t_B}$$

61. The consumer chooses the quantity of transactions from each app and the quantity of outside good subject to the budget constraint. The consumer's optimal choices can be found by maximizing the Lagrangian formula:

$$\max_{q_1, \dots, q_n, z} u(\vec{q}, z) + \lambda \left(\frac{m}{1 - t_B} - \sum_{i=1}^{n} p_i q_i - \frac{z}{1 - t_B} \right)$$

The first order condition with respect to q_i is:

$$\alpha\left(\left(\sum_{i=1}^{n}(q_i)^{\frac{1}{\rho}}\right)^{\frac{\rho}{\alpha}}+z^{\frac{1}{\alpha}}\right)^{\alpha-1}\frac{\rho}{\alpha}\left(\sum_{i=1}^{n}(q_i)^{\frac{1}{\rho}}\right)^{\frac{\rho-\alpha}{\alpha}}\frac{1}{\rho}q_i^{\frac{1-\rho}{\rho}}-\lambda p_i=0$$

For any two products i and j, this implies:

$$\left(\frac{q_i}{q_j}\right)^{\frac{1-\rho}{\rho}}=\frac{p_i}{p_j}$$

Thus, every product is consumed according to the proportion:

$$q_j=q_i\left(\frac{p_i}{p_j}\right)^{\frac{\rho}{\rho-1}}$$

E. 16

62. We can think of the consumer as making a single choice of how many units of a *composite app good* to buy and then determining how much of each app to buy based on that. Let the composite app good be:

$$\bar{Q}=\left(\sum_{i=1}^{n}(q_i)^{\frac{1}{\rho}}\right)^{\rho}$$

63. I show that the total expenditure on apps $y=\sum_{i=1}^{n}p_iq_i$ is equal to $\bar{p}\bar{Q}$ where $\bar{p}$ is the price index defined as:

$$\bar{p}=\left(\sum_{i=1}^{n}p_i^{\frac{-1}{\rho-1}}\right)^{1-\rho}$$

64. Thus, we can interpret the price index as the price of a unit of the composite good. To see this, plug in from E. 16 to $\bar{Q}$:

$$\bar{Q}=\left(\sum_{j=1}^{n}\left(q_i\left(\frac{p_i}{p_j}\right)^{\frac{\rho}{\rho-1}}\right)^{\frac{1}{\rho}}\right)^{\rho}=q_ip_i^{\frac{\rho}{\rho-1}}\left(\sum_{j=1}^{n}p_j^{\frac{-1}{\rho-1}}\right)^{\rho}$$

Thus:

$$q_i = \bar{Q} p_i^{\frac{-\rho}{\rho-1}} \left(\sum_{j=1}^{n} p_j^{\frac{-1}{\rho-1}} \right)^{-\rho}$$

E. 17

Multiplying each side by p_i:

$$p_i q_i = \bar{Q} p_i^{\frac{-1}{\rho-1}} \left(\sum_{j=1}^{n} p_j^{\frac{-1}{\rho-1}} \right)^{-\rho}$$

Summing over i, we have:

$$\sum_{i=1}^{n} p_i q_i = y = \bar{Q} \sum_{i=1}^{n} p_i^{\frac{-1}{\rho-1}} \left(\sum_{j=1}^{n} p_j^{\frac{-1}{\rho-1}} \right)^{-\rho} = \bar{p}\bar{Q}$$

Thus, we can rewrite the budget constraint as:

$$\bar{p}\bar{Q} + \frac{z}{1-t_B} = \frac{m}{1-t_B}$$

Given the budget constraint and the optimal choices of ap/in-app quantity ratios, the consumer chooses the quantities of composite good and outside good. The Lagrangian for this problem can be written as:

$$\max_{\bar{Q},z} \left(\bar{Q}^{\frac{1}{\alpha}} + z^{\frac{1}{\alpha}} \right)^{\alpha} + \lambda \left(\frac{m}{1-t_B} - \bar{p}\bar{Q} - \frac{z}{1-t_B} \right)$$

The first order conditions are:

$$\alpha \left(\bar{Q}^{\frac{1}{\alpha}} + z^{\frac{1}{\alpha}} \right)^{\alpha-1} \frac{1}{\alpha} \bar{Q}^{\frac{1}{\alpha}-1} = \lambda \bar{p}$$

$$\alpha \left(\bar{Q}^{\frac{1}{\alpha}} + z^{\frac{1}{\alpha}} \right)^{\alpha-1} \frac{1}{\alpha} z^{\frac{1}{\alpha}-1} = \frac{\lambda}{1-t_B}$$

Thus:

$$\left(\frac{\bar{Q}}{z} \right)^{\frac{1}{\alpha}-1} = \bar{p}(1-t_B) \Rightarrow \; z = \left(\bar{p}(1-t_B) \right)^{\frac{\alpha}{\alpha-1}} \bar{Q}$$

Plugging into the budget constraint and rewriting:

$$z = \frac{m\left(\bar{p}(1-t_B)\right)^{\frac{\alpha}{\alpha-1}}}{\left(\bar{p}(1-t_B)\right)^{\frac{\alpha}{\alpha-1}} + \bar{p}(1-t_B)}$$

$$\bar{Q} = \frac{m}{\left(\bar{p}(1-t_B)\right)^{\frac{\alpha}{\alpha-1}} + \bar{p}(1-t_B)}$$

E. 18

65. It follows that the negative of the elasticity of composite good with respect to the price index is:

$$\epsilon_{\bar{Q},\bar{p}} = \left[\frac{\frac{\alpha}{\alpha-1}\left(\bar{p}(1-t_B)\right)^{\frac{\alpha}{\alpha-1}} + \bar{p}(1-t_B)}{\left(\bar{p}(1-t_B)\right)^{\frac{\alpha}{\alpha-1}} + \bar{p}(1-t_B)}\right]$$

66. We can plug in $\bar{Q}$ to E. 17 to get the demand for each app:

$$q_i = \frac{m}{p_i^{\frac{\rho}{\rho-1}}\left[\bar{p}^{\frac{1}{1-\rho}}(1-t_B) + \bar{p}^{\frac{\alpha-\rho}{(1-\rho)(\alpha-1)}}(1-t_B)^{\frac{\alpha}{\alpha-1}}\right]}$$

E. 19

2. ***Firms***

67. A firm producing app i faces fixed cost F of developing the app and marginal cost c per transaction. Its profit function is:

$$\pi_i(\vec{p}) = (1-\tau)p_i q_i - c q_i - F$$

68. Where τ is the commission charged by the hypothetical monopolist, sometimes referred to as the commission. Plugging in from E. 19 we have:

$$\pi_i(\vec{p}) = \frac{((1-\tau)p_i - c)m}{p_i^{\frac{\rho}{\rho-1}}\left[\bar{p}^{\frac{1}{1-\rho}}(1-t_B) + \bar{p}^{\frac{\alpha-\rho}{(1-\rho)(\alpha-1)}}(1-t_B)^{\frac{\alpha}{\alpha-1}}\right]} - F$$

69. Each firm maximizes profit with respect to price p_i simultaneously in a Nash equilibrium. Firms account for the direct effect of p_i. Here, I assume that the firms do not take into account the effect of their individual prices on the price index $\bar{p}$. Note that this assumption is valid for markets where we see large number of products (firms). In such a case, the effect of

individual firm's price on the price index becomes negligible. The first order condition for app i is then:

$$(1-\tau)p_i^{\frac{\rho}{\rho-1}} - \frac{\rho}{\rho-1}p_i^{\frac{1}{\rho-1}}[(1-\tau)p_i - c] = 0$$

70. Under the symmetric Nash equilibrium, we have $p_i = p^* \; \forall i$. Substituting into the first order condition and rewriting, the symmetric Nash equilibrium price is:

$$p^* = \frac{\rho c}{(1-\tau)}$$

E. 20

71. Let $\pi^*(n,\tau)$ be the equilibrium profit when there are n firms conditional on the commission (note that equilibrium profit is also a function of other parameters of the model but for the ease of notation I don't write it here). Under free entry, the equilibrium number of firms $n^*(\tau)$ is such that $\pi^*(n^*(\tau),\tau) = 0$ (ignoring integer constraints on n). We have:

$$\pi^*(n,\tau) = \frac{((1-\tau)p^* - c)m}{p^{*\frac{\rho}{\rho-1}}\left[\bar{p}^{\frac{1}{1-\rho}}(1-t_B) + \bar{p}^{\frac{\alpha-\rho}{(1-\rho)(\alpha-1)}}(1-t_B)^{\frac{\alpha}{\alpha-1}}\right]} - F$$

Note that in the equilibrium the price index is:

$$\bar{p} = p^* n^{1-\rho}$$

72. Substituting in the expression for equilibrium profit, we have:

$$\pi^*(n,\tau) = \frac{((1-\tau)p^* - c)m}{p^{*\frac{\rho}{\rho-1}}\left[p^{*\frac{1}{1-\rho}}n(1-t_B) + p^{*\frac{\alpha-\rho}{(1-\rho)(\alpha-1)}}n^{\frac{\alpha-\rho}{\alpha-1}}(1-t_B)^{\frac{\alpha}{\alpha-1}}\right]} - F$$

73. Substituting for p^* from E. 20 and equating to zero, n^* is solved from the following equation:

$$\frac{(\rho-1)c}{\frac{n^*\rho c(1-t_B)}{(1-\tau)} + n^{*\frac{\alpha-\rho}{\alpha-1}}\left[\frac{\rho c(1-t_B)}{(1-\tau)}\right]^{\frac{\alpha}{\alpha-1}}} = F/m$$

E. 21

3. Calibration

74. As shown above, the negative of the elasticity of the composite good with respect to the price index is:

$$\epsilon_{\bar{Q},\bar{p}} = \left[\frac{\frac{\alpha}{\alpha-1}\left(\bar{p}(1-t_B)\right)^{\frac{\alpha}{\alpha-1}} + \bar{p}(1-t_B)}{\left(\bar{p}(1-t_B)\right)^{\frac{\alpha}{\alpha-1}} + \bar{p}(1-t_B)}\right]$$

E. 22

75. In order to conduct the SSNIP calculation, I need an estimate of parameter α, which governs the degree of substitutability between the outside good and the composite app good. To estimate α, first I estimate $\epsilon_{\bar{Q},\bar{p}}$, the elasticity of the composite app quantity with respect to the price index. In order to estimate this elasticity, I need an exogenous shifter of supply. Following Janßen et al (2022), I use the General Data Protection Regulation (GDPR) event as an exogenous supply shifter. GDPR, enacted by the EU in May 2018, imposes a series of rules intended to increase consumer security and privacy.[20] Janßen et al (2022) highlight that these rules affected the cost of developing and operating an app.[21] In order to use the GDPR event to calculate the elasticity, I look at the percentage change in the composite app good from one year before GDPR to one year after GDPR and divide by the percentage price index change from one year before GDPR to one year after GDPR.[22] To calculate the indices for one year before and one year after GDPR, I use the same estimate of ρ that was used in calculating damages, calculate q as the average number of transactions in the data used for the damages calculation over the same period as is used to calculate p, and plug them into the formula for the equilibrium price index: $\bar{p} = pn^{1-\rho}$ and composite good: $\bar{Q} = qn^{\rho}$. I also adjust the after-GDPR values for the composite good using the compounded growth rate over three years before GDPR.

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[20] Proton Technologies AG, "FAQ," available at https://gdpr.eu/faq/; *See also,* Janßen et al (2022), p. 1.

[21] Janßen et al (2022), p.4.

[22] This follows the idea of calculating the local average treatment effect famously explained in, Imbens, Guido W. and Joshua D. Angrist, "Identification and Estimation of Local Average Treatment Effects," *Econometrica*, Vol. 62, No. 2, 1994, pp. 467-475.

This gives me an estimate of elasticity of composite app quantity with respect to the price index, $\epsilon_{\bar{Q},\bar{p}}$, of 11.35.[23] Consequently, I use this estimate, the actual value of price index (calculated using the data used for the damages calculation from August 16, 2016-May 2022), and the actual value of the Google discount to calibrate α from E. 22 which gives me an α of 3.01 .[24]

76. Consequently, I calculate $\epsilon_{Q,p}$. For that calculation, I need to calibrate equilibrium prices before and after SSNIP. Also, I need to calibrate equilibrium aggregate output (total number of transactions) before and after SSNIP.

77. Using the above expressions for the price index and the composite good in E. 18, we get that the total equilibrium quantity, Q^*, is:

$$Q^* = \frac{m}{p^*(1-t_B) + n^{*\frac{1-\rho}{\alpha-1}}(p^*(1-t_B))^{\frac{\alpha}{\alpha-1}}}$$

E. 23

78. Given the estimates of ρ and α E. 20 and E. 21, evaluated at the actual values, are used to calibrate F/m and c.

79. Given the estimates of ρ, the competitive but-for commission, the commission after SSNIP, and c I use E. 20 to get p^* and p^{**} for the SSNIP equation E. 15.

80. Given the estimates of ρ, the competitive but-for commission and Play Points, the commission and Play Points after SSNIP, F/m, α, and c, I use E. 21 to calculate n^*, and n^{**}.

81. Finally, to get $\epsilon_{Q,p}$ for the SSNIP equation E. 15, I plug in the above estimates in E. 23 and calculate $[(Q^* - Q^{**})/Q^*]/[(p^{**} - p^*)/p^*]$ where those quantities and prices are evaluated at the respective equilibrium values and parameters.

82. This process allows me to account for the extent that total spending on apps would reduce if a hypothetical monopolist raised price. Note that when I calculate welfare harm, I use the CES model described in Section I of Appendix F rather than the nested CES model

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23 While the model of competition that I use, when evaluated at the observed levels of prices and apps, does not allow for the elasticity of the composite index to equal 11.35, I choose the value of alpha that provides the closest elasticity of the composite index possible in my model, which is about 1.1. *See* Rysman Workpapers.

24 *See* Rysman Workpapers.

described in this section. For quantifying welfare harm, I assume that the elasticity of total quantity to price is negative one. Assuming unit elasticity rather than elastic demand is conservative for the welfare harm calculation because if I accounted for how total spending on Google Play Store would expand as Google moved from the observed commission structure to the competitive structure, harm would be higher. Furthermore, using a conservative total market elasticity reduces the concerns about crowding introduced in Ackerberg and Rysman (2005).[25]

C. Summary

83. In summary, for the purposes of SSNIP, I adapt my damages model to investigate whether a hypothetical monopolist of both Android In-App Billing Services and Android App Distribution would find it profitable to impose a SSNIP of 10%. That is, the question is whether the markets are no broader than Android Distribution and Android In-App Billing Services. The important adjustment to the model is to relax the fixed budget assumption. The results of my SSNIP calculations summarized in the report in Section V.C.5 demonstrate that a hypothetical monopolist of Android In-App Billing Services and Android App Distribution would find it profitable to impose a SSNIP of 10%.

[25] Ackerberg, Daniel A. and Marc Rysman, "Unobserved Product Differentiation in Discrete-Choice Models: Estimating Price Elasticities and Welfare Effects," *The RAND Journal of Economics*, Vol. 36, No. 4, 2005, pp. 771-788.

Appendix G
PC App Store Commissions

App Store	Overview	Terms	Timeline of Terms	Sources
Chrome Web Store	Lets developers publish Hosted Apps, Chrome Apps, Chrome Extensions, and Themes —either free or paid—where Google Chrome users can easily find them	1) 5% commission if using Chrome Web Store API to charge for features or virtual goods 2) 30% commission for in-app payments for ARC (Android Runtime for Chrome) apps	2011 - present	[1]
Epic Games Store	A videogame store, which can be used to download games in PC and Mac The Epic Games Store has more than 650 games and apps	1) 12% commission for all games 2) 5% licensing fee waived for games using Epic's Unreal Engine	1) 2018 - present 2) 2018 - present	[2]
Microsoft Store	An "online marketplace for consumers to buy and download a variety of items," including hardware and digital content It is available as "an application on Windows operating systems (OSes) and as a web app " The Microsoft Store currently has more than 800,000 apps	1) 30% commission for Xbox console games 2) 5% commission for non-game and non-Xbox apps when users download an app through a direct URL 3) 12% commission for PC games 4) no commission for apps using a third party payment processor	1) - present 2) 2019 - present 3) 2021 - present 4) 2021 - present	[3]
Steam	A videogame store, which can be used to download games in Windows, MacOS, and Linux Steam offers about 50,000 games	1) 20% commission for every sale in excess of $50 million 2) 25% commission for every sale between $10 and $50 million 3) 30% for all other sales	1) 2018 - present 2) 2018 - present 3) 2004 - present	[4]
Game Jolt Store (Desktop)	A videogame platform, which can be used to play games on PC, mobile, and console devices	0-10% commission set by the developer	present	[5]

Sources:

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Appendix H
Alternative Android App Store Commissions

App Store	Overview	Terms	Timeline of Terms	Sources
ONE Store	A Korean Android app market, holding about 18 4% market share in the local app store market	1) 20% commission and 5% for developers with their own payment methods 2) 50% discount in commission for developers earning less than $5 million in monthly transactions	1) 2018 - present 2) 2020 - 2021	[1]
Amazon Appstore	An Android app store for downloading games and mobile apps to supported devices, which include Android devices, Windows 11 devices with windows Subsystems for Android installed, Fire tablets, Fire TV, and some Blackberry devices Additionally, users "can also shop for apps on [their] PC or Mac and then install them on a supported device "	1) 30% commission for mobile apps and in-app products 2) 20% commission for movie and TV subscription products sold in mobile apps and 30% commission for non-movie and non-TV subscription products sold in mobile apps 3) The lower of 30% commission or 80% of the list price for PC software/games and in-app products 4) Small Business Accelerator Program: 20% commission for developers earning less than $1 million in the previous calendar year Additionally, developers will receive 10% of revenue in AWS promotional credits	1) - present 2) 2018 - present 3) 2018 - present 4) 2021 - present	[2]
Aptoide	An independent Android online marketplace for apps and games with "over 300 million users, 7 billion downloads and 1 million apps "	4-25% commission for in-app transactions	present	[3]
Galaxy Store	An "app store that comes bundled on Galaxy and Gear devices The Galaxy Apps store is also a go-to source for perks and deals offered only to Galaxy and Gear users "	30% commission that can be negotiated with Samsung	present	[4]
Game Jolt Store (Mobile)	A video game platform, which can be used to play games on PC, mobile, and console devices	0-10% commission set by the developer	present	[5]

Sources:

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Appendix I

Damages Exhibits, for Consumers in Plaintiff States, by Year and State, August 16, 2016 – June 5, 2023 (in USD)

Exhibit I.1
Damages Due to Direct Effects on Prices for Consumers in the Plaintiff States, by Year and State, August 16, 2016 – June 5, 2023 (in USD)

State	Year	Pooled Markets			In-App Billing Services Market		
		Commission and Playpoints Effects	Commission Effects Only	Playpoints Effects Only	Commission and Playpoints Effects	Commission Effects Only	Playpoints Effects Only
[redacted]							

[redacted]

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Notes:

1. These figures utilize data for all states (excluding missing states) from August 16, 2016 through May 31, 2022 to calibrate my damages model.
2. To only account for the share of phones and tablets in damages, in allocating damages across state/years, I multiply net consumer spend by the share of net consumer spend for phones, tablets and missing device types for each year using the Google Monthly App Revenue Data.
3. I extrapolate net spend for June 1, 2022 through June 5, 2023 using a regression of net consumer spend on a time trend and a constant, using 2018-2022 data from the Google Transaction Data and the Google Monthly App Revenue Data. Consequently, I allocate net consumer spend proportionally by state according to the percent distribution of net spend over states for the years 2018 through 2022.

Sources:

1. Google Transaction Data.
2. Google Monthly App Revenue Data.
3. Census State Code Crosswalk.

Exhibit I.2
Damages Due to Variety Effects for Consumers in the Plaintiff States, by Year and State, August 16, 2016 – June 5, 2023 (in USD)

State	Year	Pooled Markets			In-App Billing Services Market		
		Commission and Playpoints Effects	Commission Effects Only	Playpoints Effects Only	Commission and Playpoints Effects	Commission Effects Only	Playpoints Effects Only
[redacted]							

[redacted]

[redacted]

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[redacted]

[redacted]

[redacted]

Notes: See notes in Exhibit I.1.

Sources: See sources in Exhibit I.1.

Exhibit I.3
Total Damages for Consumers in the Plaintiff States,
by Year and State, August 16, 2016 – June 5, 2023 (in USD)

State	Year	Pooled Markets			In-App Billing Services Market		
		Commission and Playpoints Effects	Commission Effects Only	Playpoints Effects Only	Commission and Playpoints Effects	Commission Effects Only	Playpoints Effects Only
[redacted]							

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Notes: See notes in Exhibit I.1.

Sources: See sources in Exhibit I.1.

Appendix J

Damages Exhibits, for all U.S. Consumers, by Year and State, August 16, 2016 – June 5, 2023 (in USD)

Exhibit J.1
Damages Due to Direct Effects on Prices for all U.S. Consumers, by Year and State, August 16, 2016 – June 5, 2023 (in USD)

State	Year	Pooled Markets			In-App Billing Services Market		
		Commission and Playpoints Effects	Commission Effects Only	Playpoints Effects Only	Commission and Playpoints Effects	Commission Effects Only	Playpoints Effects Only
[redacted]							

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Notes:

1. These figures utilize data for all states (excluding missing states) from August 16, 2016 through May 31, 2022 to calibrate my damages model.
2. To only account for the share of phones and tablets in damages, in allocating damages across state/years, I multiply net consumer spend by the share of net consumer spend for phones, tablets and missing device types for each year using the Google Monthly App Revenue Data.
3. I extrapolate net spend for June 1, 2022 through June 5, 2023 using a regression of net consumer spend on a time trend and a constant, using 2018-2022 data from the Google Transaction Data and the Google Monthly App Revenue Data. Consequently, I allocate net consumer spend proportionally by state according to the percent distribution of net spend over states for the years 2018 through 2022.

Sources:

1. Google Transaction Data.
2. Google Monthly App Revenue Data.
3. Census State Code Crosswalk.

Exhibit J.2
Damages Due to Variety Effects for all U.S. Consumers, by Year and State, August 16, 2016 – June 5, 2023 (in USD)

State	Year	Pooled Markets			In-App Billing Services Market		
		Commission and Playpoints Effects	Commission Effects Only	Playpoints Effects Only	Commission and Playpoints Effects	Commission Effects Only	Playpoints Effects Only
[redacted]							

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Notes: See notes in Exhibit J.1.

Sources: See sources in Exhibit J.1.

Exhibit J.3
Total Damages for all U.S. Consumers,
by Year and State, August 16, 2016 – June 5, 2023 (in USD)

State	Year	Pooled Markets			In-App Billing Services Market		
		Commission and Playpoints Effects	Commission Effects Only	Playpoints Effects Only	Commission and Playpoints Effects	Commission Effects Only	Playpoints Effects Only
[redacted]							

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Notes: See notes in Exhibit J.1.

Sources: See sources in Exhibit J.1.